Demand for personal real time travel information

An exploratory study of the market for BuSMS in Rio de Janeiro

BU SMS

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Summary

IFluxo is developing a service in Rio de Janeiro which provides bus travelers with a text message about when their bus is leaving. Rio de Janeiro seems to be the right place to start a service like this, because buses do not ride according a timetable. The development of the service has come to the point that research among the potential users is needed. In this research a first step is made to discover the market. The goal for this research consists out of three aspects, first a tested survey which can be used on a large scale to examine the demand for BuSMS, second a qualitative prediction about the demand for BuSMS and third recommendations for the development of the service. This research consists out of a literature study, a survey and a focus group session.

Segmentation was used to get an idea about the future users of BuSMS. In literature characteristics were found to make these segments. The segments were made based on age, frequency and type of trip (must or lust). After the literature study a survey was made. The survey served three goals: see if people were able to answer the questions, test whether the segments were chosen correctly, and retrieve information about the demand for BuSMS. It was found that people sometimes had problems with answering the right questions. The results of the survey did not show that the use of type of trip as a characteristic for segmentation was right. The use of age and frequency still seems to be good. The survey showed that there is a need for more information on the bus and that people have to wait long at the bus stop. So there is a high potential for BuSMS.

After the survey six respondents were selected for a focus group session. In this session was dealt with the current use of travel information, the need for more information and the attitude towards BuSMS. People got very frustrated about the current situation and were relieved to hear that something like BuSMS might be possible in the near future. Furthermore the participants said that they wanted as much information as possible. So BuSMS should try to offer as much information as possible. The participants were very enthusiastic about the service and would start using it immediately when possible.

Based on the results from the survey and the focus group session a new survey was made. This survey can be used on a larger scale to get a better idea about the demand for BuSMS. In the survey difficult questions are changed, irrelevant questions deleted and new questions inserted.

1   Introduction

In this chapter the reason for this research will be explained. First the current situation in transport globally and especially in Rio de Janeiro will be mentioned. Thereafter the research questions will be named.

1.1   Global problems

Conventional transport and traffic planning is not sustainable [Bannister (2005)]. The major cause for this is the use of the private car. More than 50% of the global population is living in urban areas and this number is still growing [Zandee & Hulleman (2008)]. The usage of the private car in transport is also growing. As a result of the dominancy of the private car transportation costs will rise. As more people will use the car roads will be congested, which leads to longer travel time. Public transport will also become slower, which will make it less attractive. So people will choose to travel by private car. Zandee & Hulleman (2008) show this vicious circle in Figure 1.
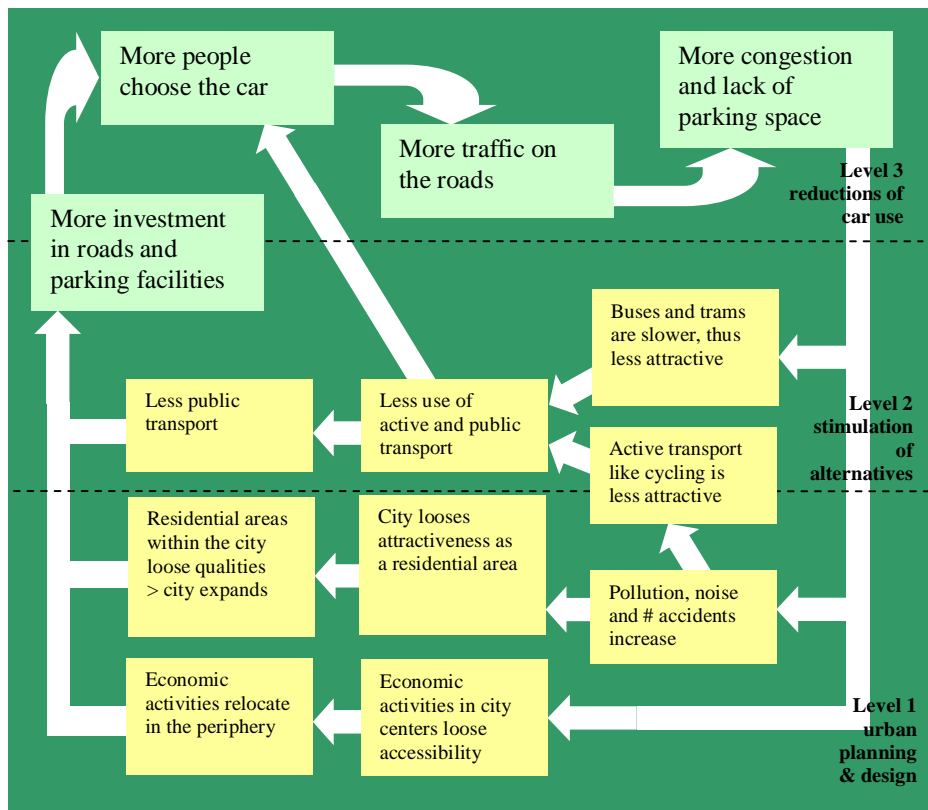

Figure 1: The negative vicious circle resulting from overflowing car mobility [Zandzee & Hulleman (2008)]

In order to achieve sustainable transport development other transport modes should be made more attractive. Public transport can be a good alternative for the car to achieve sustainable transport development.

1.2   Rio de Janeiro

In non-OECD countries and cities, like Rio de Janeiro, the car ownership is still relatively low, but the growth of car ownership will be huge. People should be given a good alternative to the car to maintain efficient transport. Otherwise car use will lead to congested cities.

In the past years the use of public transport in Rio de Janeiro has dropped from about 600 passengers in every bus per day in the mid 90's to about 460 passengers in 2008 [NTU (2008)]. The use of car on the other hand augmented. These trends are alarming and indicate that public transport services have to improve.

Bannister (2005) recommends lessons should be learned from the success of the car in order to improve the public transport services. The car is not only successful due to its functional attributes, but especially due to its hedonistical and individual attributes. To improve the attractiveness of public transport the strengths and weaknesses of public transport should be improved [Vonk (2009)]. The challenge is to change the attitude of people towards public transport. In order to do this public transport should focus on the needs and expectations of the users [Harms et al. (2007); Dziekan (2008)].

1.3   Buses in Rio de Janeiro

In 2009 Fetranspor performed a research amongst public transport users. This research showed what travelers think is important and what should be improved. Important reasons to choose for a mode were comfort, punctuality and waiting time.

When the respondents were asked what should be improved in bus transport, more comfortable aspects (benches, limit on number of persons, air conditioning) were mentioned most of the time and punctuality and waiting time were mentioned after it.

In Rio de Janeiro are a lot of bus companies. These companies focus on profit making. They tend to look only at direct costs such as fuel costs and new tires. They forget to think about making efficient schedules by changing the frequencies of the buses, so buses will not be overcrowded or on the other hand empty. Moreover the bus companies do not think about the client, the one who is paying for their services. This makes that a bus trip in Rio can be quite uncomfortable because the bus drivers are focused on getting from one point to the other as fast as possible. People do not know when buses are arriving at the bus stops, because there are no time schedules. This can lead to long waiting times at the bus stop. So it is obvious that the bus companies are not yet trying to make traveling by bus more attractive and the government is not helping either. Bus companies do not receive subsidies or alternative payment, the only income is the fee travelers pay.

The problems in public transport lead to opportunities for improvement. IFluxo is developing a service, called BuSMS, which will provide information about when buses are due to arrive at bus stops. The service will be explained in the next chapter.

1.4 Goal

IFluxo is operating in Rio de Janeiro, a city with millions of residents. All these people make trips. Some might travel by car, others choose to go by public transport. IFluxo is developing a text message service, which can give information about bus travel times. Rio de Janeiro seems to be a good place to start a service like BuSMS, because people do not know when their bus will arrive at the bus stop.

The BuSMS project has reached the point where research is necessary among the potential future users. IFluxo would like to know what the demand for their service is and which people are most interested in the service or are most likely to use the service.

The goal is being stated as follows:

> *The goal of this research is to make a survey to determine the demand for the BuSMS service, give a first qualitative impression of the demand for BuSMS in Rio de Janeiro and give recommendations about how the service should be developed.*

This research will investigate what kind of people is interested in the service and which people are not likely to use the service by dividing people into segments. This is interesting for developing the service to the needs of the future users, but it is also interesting for marketing purposes.

The results found in this research apply to Rio de Janeiro, but the methodology might also be applicable to other cities in Brazil, South-America or even worldwide. The applicability depends on the similarity between the different areas.

1.5 Research questions

This research will examine the demand for the service and it will identify the potential users. The main question that will be answered is:

What will be the demand for the BuSMS service in Rio de Janeiro and what kind of people is most interested in the service?

In order to be able to answer this question some other questions have to be answered.

This research will examine the demand for the BuSMS service for different segments. This will be done because it is expected that different groups of people will have different attitudes towards the service and this will lead to a difference in the demand for it.

> *Which segments will be most interested in BuSMS?*

This research will examine how the demand for BuSMS service can be determined and it will give a first impression of the demand. This will be done for the segments that are identified.

How can the demand of the segments be determined?

What will be the demand of the created segments for the BuSMS service?

When the demand is examined and the potential users are identified, their needs and expectations of the BuSMS service have to be examined in order to let the service be as successful as possible.

What are the needs and expectations of the future users of the BuSMS service?

1.6 Research strategy

In this part the different steps in the research will be explained.

In the first step information about different characteristics to determine the segments will be sought in literature. This will be literature about comparable services. Based on these characteristics different groups should be made. The characteristics that are found will be compared with the characteristics of the BuSMS service. In this way a first idea about the people that are interested in the service will be obtained.

In the second step a survey will be made. The survey will serve three purposes. This first survey will be a test to see if people are able to answer the questions and if the answers can be used to make conclusions concerning the future use of BuSMS. The second purpose of the survey will be to see if the segments that were created really exist and if these segments show different attitudes towards BuSMS. If the outcome of the survey shows that the segments that were made are not the best, new segments, which describe the need for BuSMS better, will be created based on the survey. The third purpose is to get a first idea about the demand for BuSMS. This first survey will be tested at Bendrix, a company in Rio de Janeiro with approximately 50 employees. The results from the survey will be used to create a final survey which can be used on a larger scale and with a more diverse population to get a better idea about the demand for BuSMS. This survey will also include questions that are relevant for the segments that were created in the first step.

After the survey is held a focus groups session will be held. In this focus group session the opinions of different people will be identified and through a discussion new ideas might be found. From the respondents, the employees at Bendrix, six people will be chosen to perform a focus group. This will be the persons that answered that they wanted to have more information about their bus trips. These people also have to score high on the important characteristics that were found in the literature study. In the focus group the participants will be asked what they think about the current situation in Public Transport and especially about the bus. Next they are asked what kind of information they would like to receive about the bus. At the end the BuSMS service is explained and the respondents

are asked what they think of it. This focus group session can give a better idea about what people really think about bus trips and what they think about BuSMS. The information from the focus group session can also be used to make adjustments to the survey, because some important questions about what people think might not yet be in the first survey.

The following scheme shows the research steps schematically.
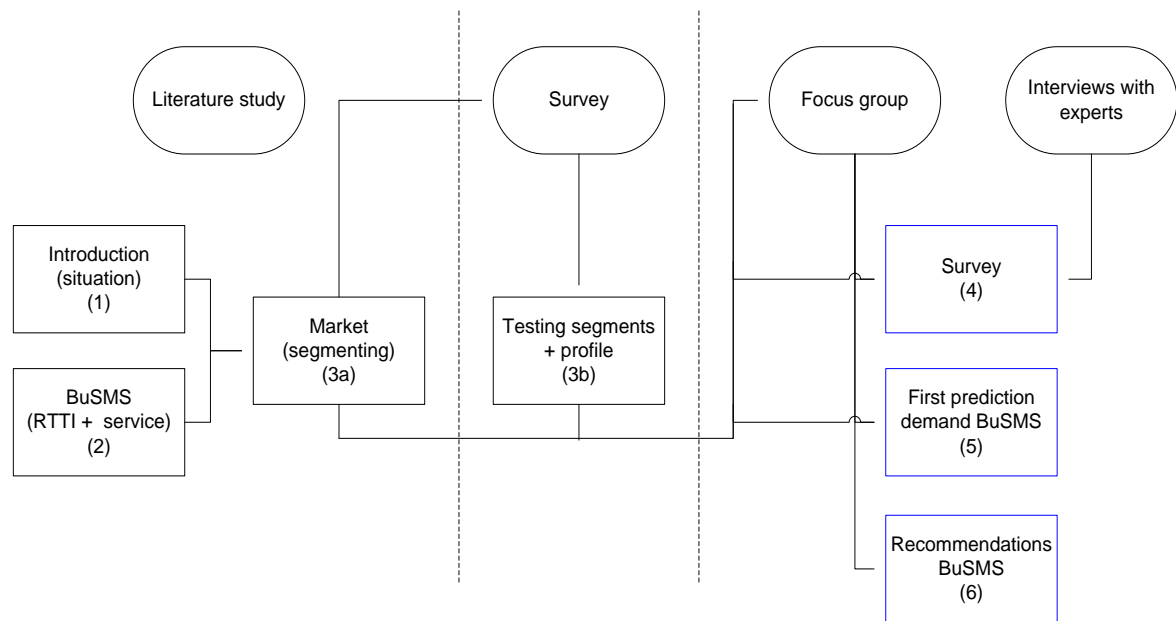
This research will have three products, a tested survey, a first prediction about the demand for BuSMS and recommendations for the BuSMS service. The survey can be used to see if people are interested in more information on their buses and which people need this information most. Furthermore the information extracted from the survey can be used to make new segments, which describe the differences in the demand for BuSMS better.

The used survey in this research and the focus group session give a global idea about the demand for BuSMS. The recommendations for the BuSMS service include recommendations for the way the information should be provided and what kind of information is needed.

2 BuSMS service

This chapter will explain what the BuSMS service is and how it will work.

2.1 Information service

BuSMS is a service which can send information about the arrival time of the bus at a certain bus stop. BuSMS is a self-service technology (SST) which means that people can get their own information. The information people receive is in real time and it is personal, BuSMS is a personal Real Time Travel Information service (pRTTI).

2.2 Information for traveler

This part describes how the BuSMS service works.

A bus traveler can go to the internet and fill in when he wants to travel and from where to where he wants to travel. The traveler can also choose to make a call and give information about his trip this way. When the traveler has given the information about the trip he will receive a text message (SMS) with the information he requested. This can be information about in how many minutes his bus is leaving and which bus he should take. In this way the waiting time at the bus stop will be minimized.

The website will offer several options. Users will be able to either receive information once, periodically or for one week. They can choose how many minutes before the arrival of the bus they want to receive a text message. Figure 2 shows the interface and functions of the website. This is not the final interface and functions might be added or changed, but it gives an idea about how it will look like. The website is an important part of the service. If the website is user-friendly and contains rich, interesting and searchable contents it will gain the approval of the users. On the other hand if the website is poorly designed and the services are difficult to use, it will likely generate negative feelings [Eriksson et al. 2007].
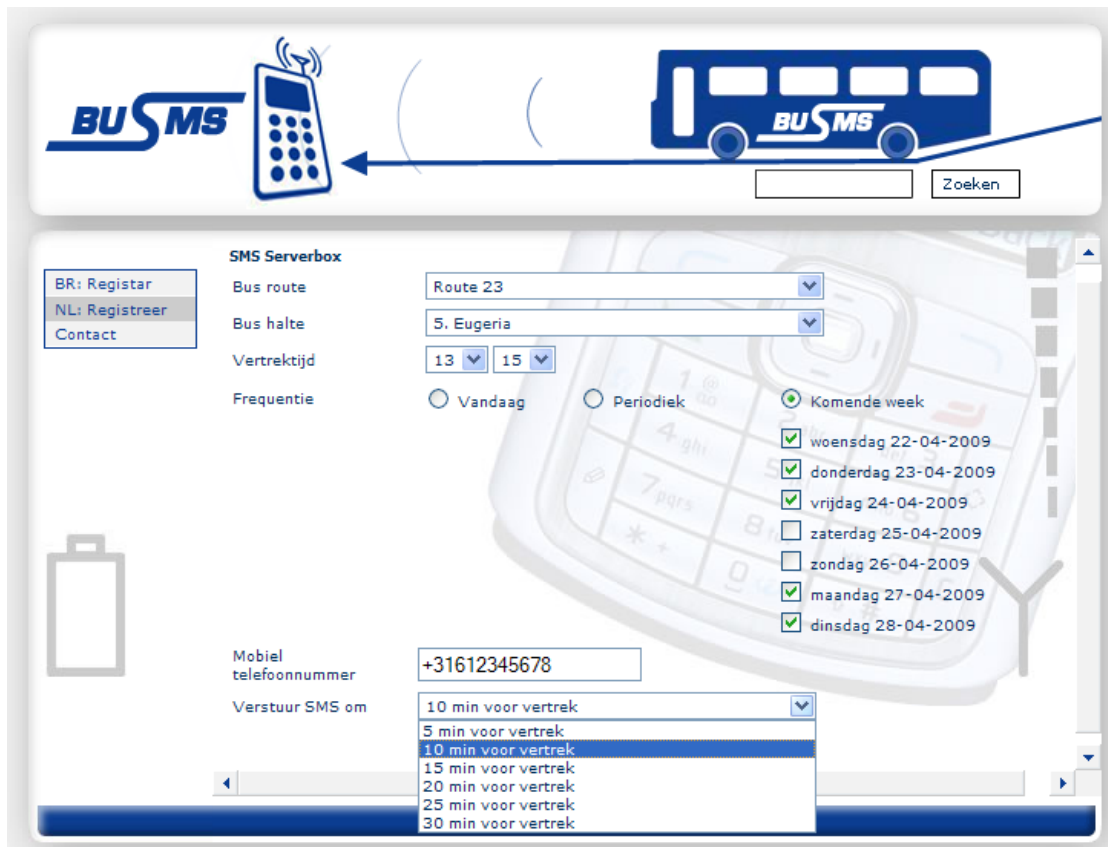
Figure 2: Lay-out of the BuSMS website

2.3 Technique

Bus travelers will be provided with information about their trip. This part will explain how this information is obtained.

Buses will be provided with gps equipment. In this way the buses will send information about their position and their speed. With this information through an algorithm the estimated time of arrival can be predicted. When someone is requesting information about his trip, the system will look which bus this user has to take and when it is arriving at his bus stop. A text message will be send to the user a few minutes before the bus arrives. The user can choose how many minutes in advance he wants to receive a text message.

2.4 Stakeholders

In this part the different stakeholders will be mentioned and their interest in the service will be stated.

IFluxo, University of Twente and Bendrix

The system is being developed by IFlluxo, University of Twente and Bendrix. They are testing the service in Rio de Janeiro and hope to sell it in the future, so it will be used in practice.

Bus travelers

Bus travelers will be the users of the service. It will provide them with more information about their bus trips. In this way the bus traveler can minimize his waiting time at the bus stop, which will lead to a better image of traveling by bus. The service might make the bus a better alternative to the car.

Bus companies

The bus companies are also the users of the service. They can use it to provide an extra service to their bus travelers and they can use it to retrieve more information about travelers. For example they will get more information about how many people are traveling by bus at what moment and what the origins and destinations are. The service might also lead to an extra source of income, because the text messages can be used for commercial purposes. Bus companies can sell some space in the text message to commercial companies.

Commercial companies

The text messages can be used to send promotional information. Because the bus travelers who use internet to receive information will have to register, a lot of information about them is known. This means that commercial companies can send information to specific target groups.

3 Market segmentation

Segmentation is the splitting of a population into smaller, relative homogenous groups [Nederstigt & Poiesz]. This chapter will deal with making different segments. First segments will be made based on literature. Through a survey these segments will be stested in practice.

BuSMS gives a commuter positive information about his trip and it leads to shorter waiting times and a door-to-door experience [Vonk (2009)]. Although it seems that everyone traveling with the bus can improve his situation, not everybody will start using BuSMS to do so. Using segmentation is useful because in this way information about different groups will be available. It is not sufficient to just look at the public transport user, because this group shows many differences on all levels [Koolen & Tertoolen]. Making segments gives a better insight in the needs and expectations of the traveler. With more segments it is easier to adjust services to the needs of specific groups. Because it is practically impossible to look at each traveler individually, segments can be made based on personal characteristics or the experience of mobility [XTNT]. Using segments can make a service more effective and efficient when subgroups differ [Weggemans & Schreuders].

In this chapter segments will be created. First the the relation between the needs and expectations of travelers and BuSMS will be explained. Then an example of existing segments in transit will be given. This example will be used to obtain a first idea about the potential users of BuSMS. Subsequently a research about which factors influence the use of technologies will be used to find factors that are relevant for BuSMS segments.

3.1 Needs and expectations travelers

When making the segmentation the needs and expectations of the bus travelers should be put in mind. The service will affect their bus trip and the experience of taking the bus. The image and perception of the bus can be described by attributes. Vonk uses nine attributes. Two supporting attributes, Reliability and Information & Communication and seven performance attributes, Time Accessibility, Accessibility in space, safety, Travel Time, Price, Comfort and Ease of use. The following figure shows how image & perception are made by travelers.
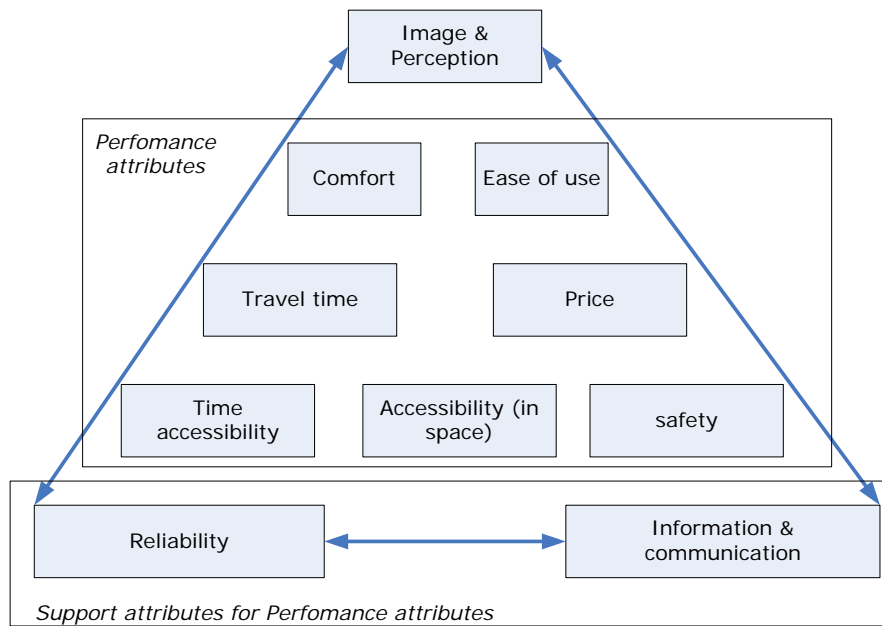
Figure 3: Principle Public transit quality attributes [Vonk (2009)]

Table 1: Quality attributes of public transport [Vonk (2009)]

Quality attributes	Definition	Influenced by BuSMS?
Accessibility (availability in space of a mode)	Easiness of access to the transport system and the activities	No
Frequency (availability in time of a mode)	Index of occurrence of the transport service within the time interval	No
Reliability	Minimization of uncertainty of the commuter in relation to the effective service delivery according to pre defined requirements.	Yes
Travel time	Period necessary to fulfill necessary activities for the displacement between an activity and another one.	Yes
Comfort	Material welfare referring to the service offered, in relation to the expectations of each one	No
Price	Value established by a political decision based on contractual definitions and/or skillful analysis	No
Safety	Confidence of the commuter that he will be protected against accidents that will affect his physiological or psychological integrity	Yes
Ease of use	The degree to which travelers spend	Yes

	affective and cognitive effort on a journey by public transportation (1)	
Communication & information	Information that customer receives, through different communication media, about the transit company contributing to his perception of the service and company	Yes

So BuSMS can serve some of the needs of travelers and can therefore make bus transport more attractive.

3.2 Existing segments in transit

Krizek et al. made segments in transit users. They identified eight different groups of users. First he made a distinction between transit users and non-users. Transit users make use of public transport, non-users on the other hand do not make use of public transport.

In their segmentation Krizek et al. make a difference between captive users and choice users. Captive users do not have the possibility to travel with another mode. Choice users do have this option, but choose to travel by public transport.

The non-users are divided in potential users and auto captives. This last group, the auto captives, never uses public transport and do not think about ever using it. The auto captives are not interesting for making segments, because they will not use the bus and do not need information about the bus. The potential users are not using public transport, but are positive about the idea of using it. They would like to start using public transport. The following figure shows the different groups of travelers.

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1 Low affective effort means feeling comfortable, experiencing pleasure and convenience accompanied by feeling secure and perceiving less stress. Low cognitive effort is defined by the system being easy to learn, providing high quality information and reliable services. Ease-of-Use is when it simply fits with people's imagination of traveling. The effort that has to be spent matches the effort people are willing to spend for their journey,[Dziekan (2008)]
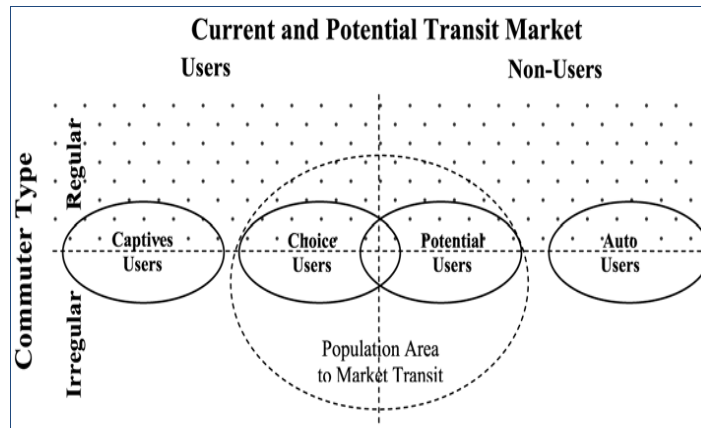
Figure 4: *Overview of current and potential transit market [Krizek et al (2007)]*

Krizek et al. make a distinction in regular and irregular travelers. This distinction might seem irrelevant. But the research shows that regular and irregular users have different preferences towards the variables that Krizek used. These variables or factors were used to explain the difference in variability in the answers of the respondents. There were different investigated preferences for the users and the non-users. The preferences can be found in Table 2 for the users and in Table 3 for the non-users. Through questions in a survey these preferences were investigated. The preferences will be compared to what BuSMS offers.

Table 2: Preferences Users compared to BuSMS

Preferences Users	Influence by BuSMS
driver's attitude	None
customer service	High
type of transit service	None
reliability service	High
how the user values time	High
cleanliness and comfort	None
safety	Moderate
personal characteristics	None

Preferences Users	Influence by BuSMS
safety and comfort	Moderate
driver's attitude	None
service amenities and special requests	High
characteristics of their typical commute	None
reliability	High
location and type of transit service	None
service attractiveness	Moderate
travel cost	None
children	None
travel time	High
personal characteristics	None

Each group of users had different preferences towards the variables Reinders used. Table 4 shows which variables from the previous two tables are preferred by the different groups of users. When most of the variables are influenced by BuSMS (see Table 2 and 3) the correspondence with the service is high, when no variables scored high the correspondence is low and when only some variables score high the correspondence is moderate.

Table 4: Preferences different segments and correspondence with BuSMS

User	Regular/Irregular	Preferences	Correspondence with BuSMS
Captive	Regular	Reliability, comfort, safety	High
	Irregular	Driver's attitude, type of service, customer support, safety	Low
Choice	Regular	Reliability, income and value of time, customer service, type of service	High
	Irregular	Driver's attitude, comfort, value of time	Moderate
Potential	Regular	Safety and comfort, service amenities and special requests, commute characteristics, reliability, children	Moderate
	Irregular	Driver's attitude, the cost of the service, travel time	Low

The regular users (captive and choice) have the highest correlation between their preferences for transit and what BuSMS offers. The irregular choice users show some correlation. The potential users might be part of the market, because they would like to use public transport. The regular potential users show some correlation with what BuSMS

offers, but research showed that it is not likely that potential users are switching modes [Chorus (2007)]. So the market for BuSMS mainly exists out of the people who already use the bus and especially the regular users.

3.3   Attitude towards Self Service Technologies

Krizek determined eight groups. But these groups are not sufficient to say something about differences in demand for the BuSMS service. In this part the report of Reinders will be used. This report shows differences in demographic and psychographic characteristics in relation to the attitude towards Self Service Technologies (SST's). The SST's used in this research was the ticketing machine from the Dutch Railways (NS) and the website and the column at the station which were used for finding travel information. The psychographic characteristics look at the mental needs of people to use new technologies. The demographic characteristics look at situational factors.

The characteristics from this research will be used as variables for the segments for BuSMS. It is expected that the attitude of people will be the same for the ticketing machine and BuSMS in regard to the different characteristics.

Reinders researched a lot of different characteristics. In the segmentation that will be done here not all of these variables will be used. Only the characteristics with the most differences in attitude towards SST's will be used.

Reinders researched the relation between personal characteristics and psychographic characteristics. The following tables show the used characteristics, less relevant characteristics for BuSMS are between brackets:

Psychographic Characteristics
Self efficacy
Need for interaction
Fear of technology
Experience with technological products
(Current self service use)
(Current self service use of NS products)

Personal characteristics
Age
Gender
Income
Usage (light, medium or heavy user)
Reason (must or lust)
Time of day (Peak, off peak, between)
(Usage of ticket machine)

Outcomes Reinder's research:

The relations between the personal and psychographic characteristics were researched by Reinders. Often the same patterns were found. People with a high self efficacy often do not need interaction, do not have fear of technology and have experience with technical products. The same can be said the other way around. So there is a correlation between the psychographic characteristics.

There were not found many differences between men and women. Men showed less fear of using a technology and women showed more confidence. On the other characteristics were no differences found. This is in contrast to what other studies about the differences between men and women have found. Several studies have found that males are more likely to use information technologies [e.g. Petrella & Lappin (2004)]. Other studies showed that females use information systems more than males [Flake (1991); MORI (2006)]. Because Reinders only looked at the attitude towards a ticketing machine, the conclusions he found about the differences between men and women might not be applicable to other services. Relations between the use of BuSMS and gender should be examined further.

Younger people (younger than 40), people with a higher education, people with a higher income, heavy users, must travelers and peak travelers have a higher self efficacy, do not need interaction, do not fear technology and have more experience with technical products. These people are more likely to use an SST. But conclusions about the use of SSTs should be made carefully, because Reinders only investigated attitudes towards the ticketing machine. Attitudes towards other SSTs might be different.

Reinders also looked at the relation between the personal characteristics. This showed that that the groups mentioned above are often the same people. Must travelers are often heavy users, highly educated, young and with a high income. These people might also be the group that is most interested in the BuSMS service.

Towards the ticket machine people had a few preferences. Most important is the actuality of the information. The time to wait for the information can be 1 to 3 minutes, but 7 minutes is too much. The information has to be reliable. The cheaper the service is the better.

People can shorten their waiting time at the bus stop by using BuSMS, but why would they want to do this? One reason is because people value their time high. This reason is already covered by Reinders' variables. People that live far from the bus stop need more time to get to the bus stop. A long waiting time at the bus stop might feel worse for them than for people who live closer to the bus stop. Another reason is because people do not like to wait at the bus stop because it is not safe, this could especially be the case in Rio de Janeiro. The waiting time is dependent of the frequency of the buses, so the frequency of the bus can also be used as a variable. People with smaller frequencies probably will use BuSMS more to shorten their waiting times. When it rains people do not like to stand in the rain, so the weather can also be an important variable.

3.4 Selecting variables for segments

In this step the variables for the segments will be selected. Because the size of the segments should not be too small not all of the variables can be used, therefore the variables will be evaluated for their suitability.

From the previous part some variables can be selected. The researches of Krizek and Reinders gave some useful variables for segmentation. The variables that will be evaluated can be put into three categories, personal, situational en trip related. The variables in each category will lead to different motives for using BuSMS (or not using it). From each category a variable will be chosen. In this way segments with useful information about the different types of travelers will be created.

Personal:
- Gender (Reinders)
- Age (Reinders)
- Income (Reinders)
- Education (Reinders)
- Heavy/light traveler (Reinders & like Krizek´s regular/irregular)

Situational:
- Peak/off peak (Reinders)
- Frequency bus (Self)
- Weather (Self)

Trip:
- Must/lust trip (Krizek & Reinders)

For the evaluation of the suitability of the variables four criteria will be used [Verhage 1994]:
- *Predictable response*, can the response of the segment be predicted and is the segment homogenous? If the variable scores negative on this criterion it is not suitable for segmentation.
- *Measurability*, can the characteristic or variable be measured?
- *Accessibility*, can the segment be reached?
- *Size*, is the segment large enough?

	Predictable response	Measurability	Accessibility	Size
Personal				
Gender	No	++	+	++
Age	Yes	++	+	+
Education	Yes	+	-	+
Income	Yes	+	-	+
Heavy/light user	Yes	-	-	+
Situational				
Peak/off-peak	Yes	+	+	+
Frequency	Yes	+	+	+
Weather	Yes	+	-	-
Trip				
Must/Lust	Yes	+	+	+

To create divers segments variables from each category will be chosen. The variables that score best on measurability, accessibility and size will be used. For the personal variables age scores the best. For the situational variables peak/off-peak and frequency score the best. One of these variables should be chosen. The frequency seems to be a better variable in this case, because peak/off-peak is expected to show correlation with must/lust, which is the variable for the trip related variables. This variable was the only one under trip, but the evaluation shows that it scores positive on all criteria and therefore it can be used for segmentation. So there are three characteristics that determine the segments:

- Age
- Must vs. lust
- Frequency of available buses

Young (younger than 40) must travelers with a low frequency of buses at their bus stop are most likely to use BuSMS. On the other hand older people, lust travelers and people with a frequency of buses at their bus stop are not likely to start using BuSMS.

It is expected that people in these segments are more likely to use BuSMS. The chance of a person using BuSMS increases as this person fits into more segments. The following picture shows this. The darker the color, the higher the possibility is of someone to start using BuSMS.
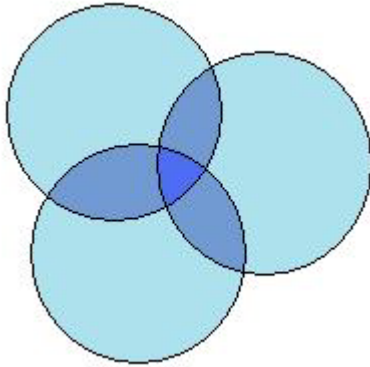
Figure 5: Each circle represents a segment. The darker the color, the higher the possibility of using BuSMS

3.5 Verifying segmentation

The segments were created based on literature. Now they should be tested in Rio de Janeiro for their suitability. This will be done by making a survey. The results of this survey should show relations between characteristics and it should give a first impression of the demand for an information service. This can be done by retrieving information about what people think about their waiting times and trying to find out if they are likely to use a new technology. This can be done by getting information about their present and past use of technologies, such as mobile phones and internet [Polydoropoulou & Ben-Akiva (1998); Yim & Khattak (2001)]. This is also important information as users of BuSMS at least should have a mobile phone and preferably access to internet.

The survey should have a few outcomes. The relations that Reinders found give information about the future user. This information should be provided by the survey as well. The segments that were made have to be verified. So questions about the age of the respondent and the trips he makes should be included (frequency and must vs. lust trips). The questions for the survey can be found in Appendix A.

4 Results

In this chapter the results of the survey and the focus group session will be presented. Through a literature study a first idea about the potential users of BuSMS was obtained. Segmentation was used to identify these potential users. Because the segments were based on particularly literature, often written in western countries, further research among the potential users of the service is required. This further research consists out of a survey and a focus group session.

4.1 Survey

The survey that was made has been tested at Bendrix, an ITC company with approximately 50 employees. These employees were asked to answer the questions in the survey. The survey was available on the intranet. Goal of this test was to see if the employees understood the questions and were able to answer these. The results of the survey also say something about the possible demand for BuSMS.

The questions for the survey can be divided in several categories. The segments were based on characteristics of people that are likely to use new technologies and benefit from the given information about their trip. Through the questions in the survey relations can be seen between these characteristics.

The survey contains questions about:

- Personal characteristics
- Technology use
- Bus use
- Attitude towards the bus

An example of the survey can be found in Appendix A.

4.1.1 Testing the survey

Because this first survey was used to test if people are able to answer all the questions, the results from the survey were evaluated.

Problems with first group of respondents (27 respondents)

First two persons were asked to fill in the questions. This was done to find errors or difficulties in the survey. These first two persons did not have any difficulties filling in the survey and no errors were found in their answers, so the survey was presented to 25 other persons. The results from these surveys were also checked for errors. In general people do not read all the information. This can be seen because respondents often answered questions they did not have to answer or did not answer questions which they should have answered.

To prevent this from happening again the survey should be one question at the time and go to the next question automatically. It should be as easy as possible to answer questions to eliminate mistakes made by respondents. The effort of the respondents should be minimized. Using interviewers would also prevent misunderstandings by the respondents.

Some examples of mistakes:

People had problems with answering the right questions. They did not read the instructions. Sometimes they could skip a question, but many people did not notice this. This led to more problems when they did read the next instruction which told them to skip the next question, but this was not applicable to them.

When people where asked why they are traveling with the bus they could choose out of several modes, with a maximum of three. Some people chose four or even five modes.

In the survey some questions dealt with the must trips and some others with the lust trip. Both parts contained the same questions to be able to compare the difference between the must and lust trip. When people were asked about their work/school related trip most of the respondents answered the right questions, but when they were asked about their leisure trip a lot of respondents did not answer the questions they should have, maybe because they had the feeling they already answered the same questions before.

Sometimes the average travel time was equal or even less than their waiting time at the bus stop. Probably these respondents misunderstood the question or the question was not formulated properly.

In the translation from the English survey to the Portuguese survey some errors were made. These errors were found after the survey was held.

Problems with second group of respondents (10 respondents)

Some changes were made to the first survey, because people did not answer the right questions. People now answered only the questions they had to answer so the adjustments were effective.

It took the respondents of the second group longer to answer the questions than the first group of respondents. In the first group most respondents could answer the questions within 10 minutes, but in the second group it took sometimes more than 15 minutes. The questions did not change much, so probably this can be explained by the fact that the second group of respondents was lower educated and needed more time to read the questions and descriptions.

4.1.2 Results survey

In this part the results from the survey will be presented.

All respondents use the bus for going to work or school (must trip). For their leisure or lust trip about 50% of the respondents use the bus on some occasions. Use of car and taxi is higher, probably because they are traveling with more people. Two third of the respondents did not have a driver's license and therefore has to make use of public transport.

In the previous chapter the segments were made based on age, type of trip (must vs. lust) and frequency of the bus. Figure 5 shows what the age of the respondents was. Most of the respondents were 20-29 years old. The frequency of the bus was measured by the estimated average waiting time at the bus stop. Figure 6 shows the estimated waiting times of the respondents. Two third of the respondents say they wait less than 15 minutes and one third say they have to wait longer than 15 minutes. All respondents were asked about their must and lust trip.
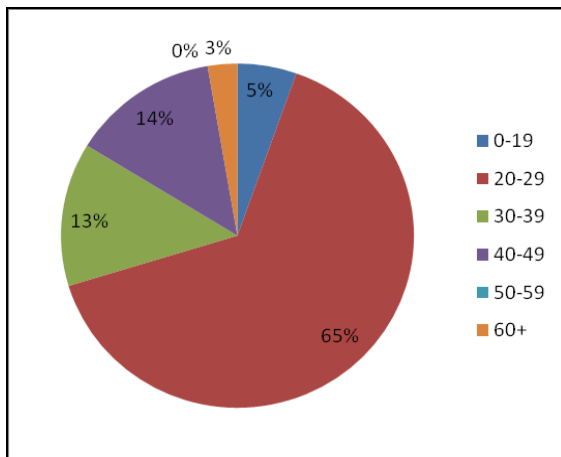

Figure 6: Age of respondents in years. Total number of respondents was 37.
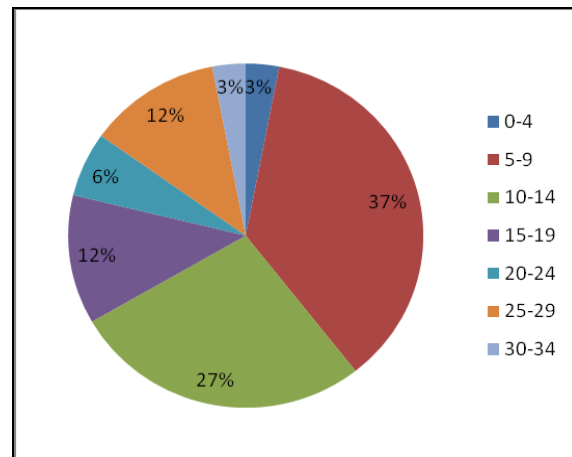

Figure 7: Average waiting time of respondents at the bus stop in minutes. Total number of respondents was 33.

It is interesting to see if there are differences between the needs for information for the different segments. The respondents were asked if they would like to have more information about when their bus is leaving. They had five options: totally disagree, disagree, neutral, agree and totally agree. These options had a score from -2 to 2, -2 corresponds with totally disagree and 2 with totally agree.

People were also asked about their technology use. It is expected that people with a higher affinity with technical products will start to use BuSMS earlier. From the answers to these questions a technology score was calculated for each respondent. In this score four variables are measured: when they started to use Internet, how often they use it, when they had their first mobile phone and if their mobile phone has an Internet connection. The higher the respondents scored the higher their affinity with technology is.

Because the survey only had 37 respondents the respondents will be divided in to two groups of more or less the same size.

The survey contained a few questions to determine a technology score. This score can be used to predict the use of a new technical product. The following table shows how this technology score is calculated. The technology score is the sum of the score for the four questions. The maximum score is 22, the minimum 3.

Table 5: Calculation of technology score

Question	Answers	Score
How often do you use Internet?	Every Day	5
	3 times/week	4
	1 time/week	3
	1 time/month	2
	Less/never	1
When did you start using Internet?	This year	1
	2008	2
	2006-2007	3
	2004-2005	4
	2000-2003	5
	Before 2000	6
Does your mobile phone have access to Internet?	Yes	5
	No	0
When did you start using a mobile phone?	This year	1
	2008	2
	2006-2007	3
	2004-2005	4
	2000-2003	5
	Before 2000	6

In Table 6 the scores for the age segments are presented. A higher score on need for information can be seen for younger people. Due to the small size of the respondent group, the results are not significant different as we will see for all the following results.

Table 6: Scores for information and technology for differences in age

Age (#)	Need for more information	Technology score
0-29 (26)	1.15 +/- 0.28	17.6 +/- 0.8
30-60+ (11)	0.00 +/- 0.60	17.2 +/- 1.2

For the must and lust trips the respondents were asked to answer questions about their must trip and their lust trip. For both types of trips they were asked if they would like to have more information about when their bus is leaving. In Table 7 the different scores are presented. In the previous chapter it was suggested that must travelers have a higher need

for information because they have to be somewhere at a certain time. But the results from the survey show that the lust travelers have a higher need for information.

Table 7: Scores for need for information for difference in type of trip

Type of trip	Need for information
Must	0,81 +/- 0.27
Lust	1,16 +/- 0.23

In Table 8 the scores for the different frequencies are presented. It was expected that people with a lower frequency, or a higher waiting time, would like to have more information about when the bus is leaving. It shows that the expectations might be right. On the other hand the table shows that people with a higher waiting time have a lower technology score, this can be a problem. Because the people with a higher need for information are also the persons that are less likely to start using a service like BuSMS. So will they start using the service?

Table 8: Scores for information and technology for differences in waiting time

Waiting time (#)	Need for more information	Technology score
0-14 (22)	0.40 +/- 0.39	18.2 +/- 0.7
15-34 (11)	1.18 +/- 0.51	15.8 +/- 1.6

Other results

Besides the characteristics for the segments some other variables were surveyed. This was done for two reasons: first to see if some of these other variables might have an influence on the need for information and second to get a good idea about what people in Rio de Janeiro think of using the bus.

As was shown In the previous chapter income and education might have an influence on the use of BuSMS. After the first results of the survey it was expected that people with larger waiting times might be people with a lower education level and a lower income. Table 8 shows that income is higher related with the waiting time than education. The need for information and the technology score are also calculated in Table 10 and Table 11. The results show some little differences.

Table 9: Correlation education and income with waiting time

Variable	Correlation with waiting time
Education	-0.1
Income	-0.4

Table 10: Scores for information and technology for differences in education level

Education (#)	Need for more information	Technology score
Primary/secondary (25)	1.12 +/- 0.30	17.1 +/- 0.9
Higher (12)	0.17 +/- 0.60	18.3 +/- 1.0

Table 11: Scores for information and technology for differences in income level

Income (#)	Need for more information	Technology score
0-1500 R$ (17)	0.92 +/- 0.48	17.0 +/- 1.3
1500+ R$ (20)	0.58 +/- 0.41	18.4 +/- 0.7

The survey also contained some questions about the use of the bus in general. This gave the following results.

People feel very unsafe at the bus stop. Some respondents answered neutral to the question: "Do you feel safe at the bus stop?", but most respondents answered negatively and no respondents were positive. The score on this question was -1.24 (scale -2 to 2). This can be a reason for people to start using BuSMS. In the future there might be some more research in to this.

The time of arrival is very important, the question: "How important is the time of arrival?", scored an average of 1,54 (scale -2 to 2). So what people actually want to know is when they will arrive at their destination. May be BuSMS can provide such information.

4.1.3 Conclusion Survey

Important to see is that a lot of people would like to have more information about the buses. Waiting times at the bus stop sometimes can take longer than 15 minutes.

For the segments based on age and frequency the expected results were seen, although the results were not significant. Younger people and people with a lower frequency of available buses have a higher need for information. On the other hand the relation between the type of trip, must or lust, was different than expected. The need for information was higher for lust travelers. This is probably caused by the fact that the lust trip is often a trip that has never been made before, so people would like to have more information to be surer about the trip they are going to make.

4.1.4 Recommendations for next survey

To prevent mistakes by the respondents the survey should be one question at the time and go to the next question automatically. It should be as easy as possible to answer questions to eliminate mistakes made by respondents. The effort of the respondents should be minimized. Using interviewers would also prevent misunderstandings by the respondents.

It is very useful to conduct more surveys to obtain an idea about what people think about the bus and information about it. Next surveys should have more respondents from a more diverse population. In this way differences between groups of persons can be seen. The two surveys that were conducted in this research did not show many differences because all the respondents worked for the same company, were of the same age and had similar backgrounds.

4.2 Focus group session

After the survey a focus group session was planned to retrieve more information about the need for more information and especially about BuSMS. From the first group of respondents six people were selected based on their need for information about their bus, frequency of the bus and their technology score. At the moment of the session, one of the selected persons had vacation so the session was with five persons. Four of them were female and one male. Furthermore four persons were between 20-29 years old and the other one between 30-39 years. Three persons had education level Nivel Supérior (higher level), one Universitário (university) and one 2º Completo (secondary school). Only one of them had a driver's license, but this one had no car available at home. It takes the respondents more than 1,5 hours to get to work.

Problems

During the session no problems were found, but one of the participants never uses the bus to go to work, she uses the train. The bus takes four hours while the train only takes one-and-a-half. When the participants were selected, it was the intention to select persons that frequently use the bus to get to work. The participant that used the train answered in the survey that she uses the bus and the train to go to work. Respondents had the option to choose two modes to indicate that they make a multimodal trip. Apparently this one respondent misunderstood the question. In the next survey this question should be changed, so that it is clear that respondents should choose the mode or modes in case of a multimodal trip which they usually use.

4.2.1 Results

The results from the focus group session will be elaborated in this part. During the focus group session the participants were asked about several aspects. First they were asked about their currents use of travel information, then about what kind of information they would like to receive and finally the BuSMS service was presented and they were asked about what they thought of it and if they would use it. Each of these aspects will be dealt with in the following part:

Current use of travel information
All participants use internet to get information about which bus they have to use. They use maps.google.com.br. Websites from Rio de Janeiro were not used and not known (rioonibus.com.br and vadeonibus.com.br). One of the participants once called the bus

operator of the bus line she had to take to ask when this bus was leaving. The other persons were not so happy with this way of getting information, because it is not reliable. The person who is responsible for sending the buses out cannot be trusted.

Need for more information about the bus
In general people would like to have as much information as possible, presented in a way so they can make the best choice. The participants said that they would like to receive more information about the bus, information about travel times, but also about service quality. The participants do not like to travel with the bus when they have to stand in the bus because all the seats are taken, so they would like to know if the bus is crowded. The participants would like to have more information about travel times of the bus, because sometimes they are waiting just a few minutes and other times 20 or more minutes. They would like to have information on departure times so they can organize their lives better. They understand that the time of arrival cannot be estimated precisely, because all kind of things that lead to a delay can happen during the trip. More information about the price of the bus is also useful according to the participants. Buses with a higher ticket price are more comfortable. The participants prefer a bus with a lower frequency and a bus that stops at fewer bus stops, partly because in the other buses poor people and beggars are also traveling. People get stressed during the trip with the bus. This stress is caused by the fear of being robbed, fear of getting at work too late and losing the job and because of standing in an overcrowded bus.

It can be seen that people would like to have information for their worst experience trip and that they would like to be in control of their trip by having as much information as possible.

Attitude towards BuSMS
The participants were very enthusiastic when they saw the possibilities of BuSMS, especially when one of them received a demo text message.

The participants would like to have information about their regular and irregular trip, for their daily trip because arriving on time is important, for their weekend trip because the frequency of the buses is lower and less reliable. They also would like to receive information about several buses they can take. So not only the first possible option, but also the next bus or buses.

The participants were asked if they would like to pay for the service. They thought this seemed to be reasonable. A price of R$ 0,35 seemed to be acceptable. Also packages were suggested, acceptable prices were:

- R$ 3,- for 10 Busms
- R$ 5,- for 20 Busms
- R$ 10,- for 50 Busms

Off course when the service could be for free it would be great, the participants were quite surprised to hear that the service might be for free in the future.

During the session the participants were asked how they would like to state which trip they were to make. They preferred to use reference points to indicate from where to where they are traveling. Second best option is to use the crossings of streets to indicate the origin and destination. Some people knew the numbers of the bus stops and all of them know the number of the bus line. For irregular trips they would like to be able to make a call with a call centre to ask about information. They would use the website for their regular trips and the telephone (text message or call with call centre) for their irregular trips. The participants would like to have information about all the modes, not only bus, but also the train, metro and bus. The website should be easy to use. So people should be able to indicate from where to where they would like to travel and when they would like to do this.

Finally the participants would like to know when the service was ready to use.

4.2.2 Conclusion focus group session

At the moment very little information is available about the bus, this annoys people. There is a need for more information. People like to make a good choice and like to be in control of their trip. It is very important for people to arrive at work on time, because people can get fired easily when they get to work too late.

Participants at the focus group session were enthusiastic about the service and would like to start using it as soon as possible.

Recommendations

The focus group session turned out to be very useful, it showed that there is need for a service like BuSMS and some remarks were made about how the service should be like. In the future more of these sessions can be held during the development of BuSMS to get the service into line with the needs of the future users.

5 Survey

In this chapter a survey will be presented which can be used to retrieve a better idea about the demand for BuSMS in Rio de Janeiro. The survey might also be used in other cities and countries.

In chapter 3 segments were created based on age, frequency of the bus and type of trip. The tested survey showed that people do not need more information for their must trip, so in the new survey there will not be different questions for the type of trip. The other two characteristics will be used in the new survey.

In the first survey there were no questions directly about BuSMS. In the new survey there should be more questions about how people would like to receive information, what information they would like to receive and if they would use a service like BuSMS.

The focus group session showed that people do not only need information about when the bus is leaving, but also about other aspects. They would like to know what the service quality of the bus is, which lines they can use and when the next buses are arriving. In the new survey questions about these types of information will be used to see what kind of information people need the most.

In the new survey questions about the current technology use will be included just as in the first survey. The answers to these questions can be used to calculate a technology score. This score shows how high the affinity with technology is and how soon someone will start to use a new technology.

Below is the new survey, which can be used on a larger scale. Irrelevant questions are deleted and new questions are inserted. The first survey took the respondents about 10-15 minutes to complete. The survey that is presented here will take less time because it contains less questions. It is estimated that it will take 5 to 10 minutes to complete all the questions.

Survey "Demand for BuSMS"

Introduction

The results of this survey will be used to get a view about the travel behavior of people in Rio de Janeiro and especially about the use of the bus.
Please read each question carefully and try to answer it as correct as possible.
You can fill in this test anonymously. The results of this survey will not be used for other purposes.

Questions:

First you are asked to answer some personal questions

1. What is your age?
<0-19> <20-29> <30-39> <40-49> <50-59> <60+>
2. What is your gender?

<Male> <Female>

3. What is your highest level of education?

<Brazilian school system>

4. How many people are in your household?

<1> <2> <3> <4> <5> <6> <7> <8+>

5. What is the average monthly income of your household?

<Choose right scale>

6. Do you have a driver´s license?

<yes> <no>

7. How many cars and motors are there in your household?

<0> <1> <2> <3> <4+>

In the next questions you are asked about your internet use and your mobile phone use

8. Do you have access to Internet at home?

<Yes> <No>

9. Do you have access to Internet somewhere else (work or school)?

<Yes> <No>

10. How often do you use Internet?

<Every day> <3 times/week> <1 time/week> <1 time/month> <less/never>

11. When did you start using Internet?

<This year> <2008> <2006-2007> <2004-2005> <2000-2004> <before 2000>

12. Do you have a mobile phone?

<Yes> <No>

13. Does your mobile phone send/receive sms?

<Yes> <No> <Not applicable>

14. Does your mobile phone have access to Internet?

<Yes> <No> <Not applicable>

15. When did you start using your a mobile phone for the first time?

<This year> <2008> <2006-2007> <2004-2005> <2000-2004> <before 2000>

In the next questions you will be asked about trips you make by bus

16. How often do you use the bus?

<Every day> <5 times/week> <3 times/week> <1 time/week> <1 time/month> <less/never>

17. When do you usually travel with the bus?

<Peak> <Off-peak>

18. How long does your usual bus trip take in minutes?

<0-14> <15-29> <30-44> <45-59> <60-74> <74-89> <90+>

19. How long is your average waiting time for the bus in minutes?

<0-4> <5-9> <10-14> <15-19> <20-24> <25+>

20. What do you think of the frequency of the bus?

<Too low> <Low> <Neutral> <Quite good> <Really good>

In the following part you are asked to rate some aspects of the bus trip you make for work/school from 1 to 5.
Where 1 = totally don't agree and 5 = totally agree

21. There are enough bus lines
22. Arriving on time is important
23. I can find information about when my bus leaves
24. I can find information about which bus I have to take
25. I would like to have more information in advance about the expected arrival times of the bus

In the following part you are asked to rate some aspects of the bus trip you make for your leisure activity from 1 to 5. Where 1 = totally don't agree and 5 = totally agree

26. I feel safe at the bus stop
27. Arriving on time is important
28. I can find information about when my bus leaves
29. I can find information about which bus I have to take
30. I would like to have more information in advance about the expected arrival times of the bus at the bus stop

31. Suppose you could receive information about when your bus is leaving which of the following media would you like to use to state when you want to travel and from where to where you are travelling.
<Internet> <e-mail> <text message> <call>

32. How would you like to receive this information about the bus?
<Internet> <e-mail> <text message> <call>

In the near future there will be a service that can tell you when your bus is arriving at your bus stop. You can go to the Internet and say at what time you want to leave and from where to where you are traveling. You can choose how many minutes before the arrival your bus you want to receive a text message on your mobile phone with the information. On this website it is also possible to say that you are making the same trip on several days. You will receive a text message each day you want to. The next questions are about this service.

33. Would you use this service?
<Yes> <No>
34. In what kind of additional information are you interested?
<Price> <Air conditioning> <Number of bus line> <Next buses> <Other, namely>

6 Conclusion and recommendations

The goal of this research consisted out of three products. First a survey was to be made to examine the demand for BuSMS in Rio de Janeiro, second a first prediction about the demand for BuSMS was to be estimated and third recommendations about how the service should look like had to be made. In this chapter the outcomes of these three aspects will be dealt with. Finally some recommendations for further research will be given.

6.1 Survey

During the research a first survey was made. This survey was tested among a small group of respondents. Goal of this survey was to see if people were able to answer all the questions, who will be the potential users and how many people will use the service. The results of the first survey were also used to make a new survey. The survey is presented in chapter 5. The survey contains questions about demographic characteristics, about technology use, travel behavior and about travel information. The questions about the technology use and travel information together give an idea about the use of BuSMS. The demographic characteristics and the answers to the travel behavior questions can be used to see who are interested in BuSMS, who will be the potential users. In this research segments were already created. In the next paragraph the conclusions about these segments will be presented.

6.2 Demand BuSMS

In the first stage of this research segments were created based on age, frequency of the bus and type of trip. It was expected that these segments would show a difference in use of BuSMS. This was tested by the first survey. Due to the few respondents the results were not significant, but they can give a global idea. The results of the survey show that younger people have a higher need for information. It was expected that these younger people would also have a higher affinity with technology, measured by the technology score, but this was not found. For the frequency variable it was found that people with a higher waiting time indeed needed more information. For the type of trip, must versus lust, the expected results were not found, in fact the lust trip scored higher on the need for information. So type of trip is not the right variable to use for segmentation.

Through the survey and a focus group session a first prediction about the demand for BuSMS can be made. The survey showed that a lot of people have long waiting times. The average waiting time was more than 15 minutes. Especially people traveling from the Zona Norte to the Zona Sul have to wait very long, because there are fewer buses. BuSMS can help these people reducing their waiting time at the bus stop. During the focus group everybody was very enthusiastic about the service. Knowing when the bus arrives is very important, because people do not want to miss it, this might cost them their jobs on the long run.

BuSMS has a high potential in Rio de Janeiro, because a lot of people can benefit from this service. Especially people traveling from the Zona Norte to the Zona Sul, often people with a lower income and higher chance of being fired, can really use the information.

6.3   Recommendations BuSMS

During the focus group session it was found that people want to have as much information about their trip as possible, they want to make best choice. So they want to be in control and do not want to rely on someone or something else. For BuSMS this means that the service should be able to offer not just information about the arrival times of the bus, but more options. For people in Rio de Janeiro arriving on time at work is very important, because people will be fired easily when they show too late at work a few times. Therefore an estimation of the time of arrival at the destination is useful information. Another aspect of being in control has to with other modes. A lot of people have to travel with several modes or have the option to choose between modes. Therefore BuSMS should offer information about more modes than only the bus. In this way one can find the best trip. Other important information for people is the quality of service. In Rio de Janeiro are buses with different prices and different levels of comfort. More expensive buses are often air conditioned. The cheaper buses on the other hand are more crowded and there is more violence and robbery on these buses. Therefore BuSMS should be able to make a distinction in price and service quality. In the focus group session the participants were also asked about how they would like to receive information. They said that for regular trips the website seems to be the best and for irregular trips they would like to make a call to a call centre, because they do not know everything about their irregular trip. The easiest way to state the origin and destination of the trip is through reference points, or through street crossings.

6.4   Recommendations further research

The results from the survey showed that people feel very unsafe at the bus stops. This might also be a reason for people to start using BuSMS. When BuSMS is being launched this feeling of being unsafe can be used for promotion. Maybe parents will start using BuSMS to know when their child has to go to the bus. Parents will not like that their children have to wait for the bus at unsafe bus stops, with BuSMS they will spend less time at these stops. Most researches only look at people older than 15-18 years, but younger children might also be potential users of BuSMS.

In the survey and in the focus group session most participants came from the Zona Norte. These people thought that the frequency of buses in the Zona Norte was lower than in the Zona Sul. In this research a difference in need for BuSMS between residents from the Zona Norte and the Zona Sul was not found. In a further research this can be examined. If there is a difference found, a better idea of the market is obtained and this makes marketing easier.

During the development of the BuSMS service it is usefull to conduct more focus group sessions. Especially during the development of the website the input from future users can be vital. If they do not like it, things can be adjusted.

7 References

[Agência Brasil (2009)] Craide, S. (2009). Número de assinantes de telefônica celular no Brasil já ultrapassa 151 milhões. Retrieved August 31, 2009, from http://www.agenciabrasil.gov.br/noticias/2009/02/18/materia.2009-02-18.3752888527/view

[Bannister (2005)] Bannister, D. (2005). *Unsustainable Transport- city transport in the new century.* England: Routledge

[Chorus (2007)] Chorus, C.G. (2007) *Traveler response to information*

[Dziekan (2008)] Dziekan, K. (2008). *Ease-of-Use in Public Transportation – A User Perspective on Information and Orientation Aspects.*

[Flake (1991)] Flake W.L. (1991), *Influence of Gender, Dogmatism, and Risk-Taking Propensity upon Attitudes Toward Information from Computers*

[Eriksson et al. (2007)] Eriksson, L., Friman, M. & Norman, A. C. (2007). Electronic service quality: Public transport information on the internet, *Journal of public transportation*, 10 (3), 35-46

[Fetranspor (2009)] Fetranspor (2009). *Imagem dos meios de transportes coletivos* [Powerpoint Presentation]

[Folha (2009)] Folha online, (2009). Número de internautas residenciais ativos dobra em três anos no Brasil, Retrieved August 31, 2009, from http://www1.folha.uol.com.br/folha/informatica/ult124u490856.shtml

[Harms et al. (2007)] Harms, L., Jorritsma, P., Kalfs, N., (2007). *Beleving en beeldvorming van mobiliteit (perception and image of mobility).* Kennis instituut voor Mobiliteit

[IDG Now (2009)] IDG Now!, (2009). Número de internautas no Brasil cresce 10% em um mês, aponta Ibope, Retrieved August 31, 2009, from http://idgnow.uol.com.br/internet/2009/08/20/numero-de-internautas-no-brasil-cresce-10-em-um-mes-aponta-ibope/

[Koolen & Tertoolen] Koolen, R. & Tertoolen, G. *Back to the future, over een toekomst voor het openbaar vervoer.*

[Krizek et al. (2007)] Krizek, K. J. & El-Geneidy, A. (2007). Segmenting preferences and habits of transit users and non-user, *Journal of public transportation*, 10 (3), 71-94

[MORI (2006)] MORI (2006) *Contribution made by Traveline Scotland to modal shift*

[Nederstigt & Poiesz (2006)] Nederstigt, A.T.A.M. & Poiesz, Th.B.C. (2006) *Consumentengedrag.*

[NTU (2008)] NTU, (2008). *ANUÁRIO NTU 2007-2008.* BRASÍLIA, Brazil

[Petrella (2004)] Petrella, M. and Lappin, J. (2004) *Los Angeles and Seattle: a comparative analysis of customer response to online traffic information.*

[Polydoropoulou & Ben-Akiva (1998)] Polydoropoulou, A., Ben-Akiva, M., (1998). *The effect of advanced traveler information systems (ATIS) on travelers' behaviour.*

[Reinders (2007)] Reinders, M., Hagen, van, M. & Frambach. R. (2007). *Onderzoeksrapport Self-service technologies*

[Verhage (1994)] Verhage, B. (1994). *Grondslagen van de marketing.* Houten: Stenfert Kroese

[Vonk (2009)] Vonk, W. (2009) *Phd personal RTTI and Public transport (unpublished)*

[Weggemans & Schreuders] Weggemans, T. & Schreuders, M. (2005). *Handboek segmentatie.* Rotterdam: Adviesdienst Verkeer & Vervoer

[XTNT] XTNT Experts in Traffic and Transportation, *De reiziger centraal, wat betekent dat?*, KPVV

[Yang et al. (2005)] Yang, Z., Cai, S., Zhou, Z. & Zhou, N. (2005). Development and validation of an instrument to measure user perceived service quality of information presenting Web portals, *Information & Management*, 42, 575-589

[Yim & Khattak (2002)] Yim, Y., Khattak, A.J., (2002). *Traveler response to new dynamic information sources: analyzing corridor and area-wide behavioral surveys.*

[Zandee & Hulleman (2008)] Zandee, R. & Hulleman, R. (2008). *Bundling of qualities*, presented at PLURIS, Santos

Appendix A

Survey "Bus transport"

Introduction

The results of this survey will be used to get a view about the travel behavior of people in Rio de Janeiro and especially about the use of the bus.
Please read each question carefully and try to answer it as correct as possible.
You can fill in this test anonymously. The results of this survey will not be used for other purposes.

Questions:

First you are asked to answer some personal questions

1. What is your age?
   <0-19> <20-29> <30-39> <40-49> <50-59> <60+>
2. What is your gender?
   <Male> <Female>
3. What is your highest level of education?
   <Brazilian school system>
4. How people are in your household?
   <1> <2> <3> <4> <5> <6> <7> <8+>
5. What is the average monthly income of your household?
   <Choose right scale>
6. Do you have a driver´s license?
   <yes> <no>
7. How many cars and motors are there in your household?
   <0> <1> <2> <3> <4+>

In the next questions you are asked about your internet use and your mobile phone use

8. Do you have access to Internet at home?
   <Yes> <No>
9. Do you have access to Internet somewhere else (work or school)?
   <Yes> <No>
10. How often do you use Internet?
    <Every day> <3 times/week> <1 time/week> <1 time/month> <less/never>
11. When did you start using Internet?
    <This year> <2008> <2006-2007> <2004-2005> <2000-2004> <before 2000>
12. Do you have a mobile phone?
    <Yes> <No>
13. Does your mobile phone send/receive sms?

<Yes> <No> <Not applicable>
14. Does your mobile phone have access to Internet?
<Yes> <No> <Not applicable>
15. When did you start using your a mobile phone for the first time?
<This year> <2008> <2006-2007> <2004-2005> <2000-2004> <before 2000>

In the next questions you will be asked about trips you make for your work or education

16. Which mode do you usually use to go to work/school?
<Car> <Motor> <Bus> <Train> <Metro> <Boat> <Bike>
17. Why do you use this mode (max. 3 options)
<Only option> <Cheapest> <Fastest> <Most comfortable> <Easiest accessible>
<Most punctual> <Least waiting time> <Safest>
18. Do you ever use the bus for this trip?
<yes> <no>

If you answered no, please answer the following question.

19. Do you have the possibility of using the bus for this trip?
<yes> <no>

If you answered yes, please answer the following question.

20. Why don't you use the bus (1 option)?
<Too expensive> <Not comfortable> <Takes more time> <Not safe> <No place to sit>

If you answered yes to 17, please answer the next questions.

21. How often do you make this trip?
<Every day> <5 times/week> <3 times/week> <1 time/week> <1 time/month>
<less/never>
22. When do you usually travel with the bus?
<Peak> <Off-peak>
23. How long does your usual bus trip take in minutes?
<0-14> <15-29> <30-44> <45-59> <60-74> <74-89> <90+>
24. How long is your average waiting time for the bus in minutes?
<0-4> <5-9> <10-14> <15-19> <20-24> <25+>
25. What do you think of the frequency of the bus?
<Too low> <Low> <Neutral> <Quite good> <Really good>

In the following part you are asked to rate some aspects of the bus trip you make for work/school from 1 to 5. Where 1 = totally don't agree and 5 = totally agree

26. There are enough bus lines

27. Arriving on time is important
28. I can find information about when my bus leaves
29. I can find information about which bus I have to take
30. I would like to have more information in advance about the expected arrival times of the bus

In the next questions you will be asked about the leisure trips you make

31. Which mode do you usually use to go to work/school?
<Car> <Motor> <Bus> <Train> <Metro> <Boat> <Bike>
32. Why do you use this mode (max. 3 options)
<Only option> <Cheapest> <Fastest> <Most comfortable> <Easiest accessible> <Most punctual> <Least waiting time> <Safest>
33. Do you ever use the bus for this trip?
<yes> <no>

If you answered no, please answer the following question.

34. Do you have the possibility of using the bus for this trip?
<yes> <no>

If you answered yes, please answer the following question.

35. Why don't you use the bus (1 option)?
<Too expensive> <Not comfortable> <Takes more time> <Not safe> <No place to sit>

If you answered yes to question 33, please answer the next questions.

36. How often do you make this trip?
<Every day> <5 times/week> <3 times/week> <1 time/week> <1 time/month> <less/never>
37. When do you usually travel with the bus?
<Peak> <Off-peak>
38. How long does your usual bus trip take in minutes?
<0-14> <15-29> <30-44> <45-59> <60-74> <74-89> <90+>
39. How long is your average waiting time for the bus in minutes?
<0-4> <5-9> <10-14> <15-19> <20-24> <25+>
40. What do you think of the frequency of the bus?
<Too low> <Low> <Neutral> <Quite good> <Really good>

In the following part you are asked to rate some aspects of the bus trip you make for your leisure activity from 1 to 5. Where 1 = totally don't agree and 5 = totally agree

41. There are enough bus lines

42. Arriving on time is important

43. I can find information about when my bus leaves

44. I can find information about which bus I have to take

45. I would like to have more information in advance about the expected arrival times of the bus

In the last questions you will be asked about your opinion about some aspects of the bus.

46. Do you feel safe at the bus stop?

<Not at all> <Not really> <Neutral> <Quite safe> <Really safe>

47. I like to use the bus

<Totally disagree> <Disagree> <Neutral> <Agree> <Totally agree>

48. I would recommend using the bus to my friends for making the trips I do

<Totally disagree> <Disagree> <Neutral> <Agree> <Totally agree>

49. How appealing overall is using the bus?

<Totally not appealing> <Not appealing> <Neutral> <Appealing> <Totally appealing>

50. People like me do not use the bus

<Totally disagree> <Disagree> <Neutral> <Agree> <Totally agree>

Thank you for filling in this survey!

Appendix B

Focus group session

Part I

Check if the right people are present. Are the answers they gave correct? Did they understand the survey?

- Did you answer that you want to have more information on bus information?
- Do you often use Internet?
- What did you think of the survey you filled in?
    - Were there difficult questions or other difficulties?

Introduction into what a focus group is. Make clear that there are no wrong answers and that everybody should participate in the discussion/meeting.

Explain that in this focus group we would like to know more about what kind of information people would like to receive about the bus and how they would like to receive this information.

Questions:

- Can you find information about when your bus leaves?
    - How do you find this information?
- Can you find information about which bus you have to take to get somewhere?
    - How do you find this information?

Show some examples of ways to receive information:

- Rioonibus.com
- Vadeonibus.com.br
- Maps.google.com

- Do you know these websites?
    - Did you ever use it and what did you think of it?

Let people think about the bus trips they make.

- What kind of information are you interested in?
    - Travel times of the bus
    - How many minutes till next bus
    - Which bus to take/bus routes
    - Multi modal trips

- How would you like to receive this information?
    - At bus stop
    - At home (e.g. internet)
    - On a mobile phone

Part II

Explain BuSMS. How it works, how people can retrieve their information, what kind of information they can receive.

Questions:

- Would you use BuSMS to get information about your bus?
    - For what kind of trips would you use it, daily or irregular?
- How would you like to indicate from where to where you are traveling?
    - Street name
    - Neighborhood
    - Name bus stop
    - Click on a map
- How do you prefer to use the service for regular trips? Go to the website or just send a text message with a standard text?
- Would you like to be able to indicate that you are making the same trip on several days?
    - How would you like to do this?
- Would you like to say something else about this service?