

InfoRio, focus group sessions to test potential for a personal real time travel information concept for public transport

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ABSTRACT

This paper describes the development of a market research method in order to establish the potential demand for a Personal Real Time Travel Information (PRTTI) concept applied to public transport (PT) in Rio de Janeiro, called InfoRio. In order to receive personal travel information on PT services the customer must register via internet or by sending an SMS. A few minutes before his trip he will receive a SMS informing him the dynamically estimated time of arrival of his bus service at his desired bus stop.

The Triade model – a model that establishes the motivation, capacity and opportunity of customer segmentations to buy or use a service – has been adapted to travel behavior in order to identify the market segments and has been tested in a pilot survey. The following segmentations were identified: (1) non users of InfoRio service; (2) choice users that will deliberate over the received information (3) habit users that will include the information in their travel behavior. A focus group session is used to get better insight in the customer segment with the highest score on the Triade scale, which confirmed their interest in using the service. Due to the low number of respondents – nine out of forty— we cannot give indications about potential market size. The main benefit they attributed to the service is that it increases the reliability of the bus service and as a consequence they can better plan their activities.

We concluded that the developed method, consisting out of a revealed preference survey and followed by focus group sessions with the segmentation groups, gives a good insight in the market potential of a new service and is easy to execute. Future surveys should have more respondents and focus group sessions with all segmentation classes should be executed to develop a detailed profile of the potential market of InfoRio.

Keywords: Advanced Travel Information Systems, Public Transport Service Quality, Market Research Method

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Introduction

This article reports the results of the next steps in the InfoRio research project. In Vonk, Hulleman, Bodmer & van Berkum (2009) we presented a concept for personal Real Time Travel Information for Public Transport: InfoRio.

Nowadays the number of persons living in urban centres is growing as well as the use of the private car as a means of transport. This results in a decrease of the quality of life, huge environmental impact, both locally –noise, air quality– and global – greenhouse gas emission. Moreover, the transportation costs rise when the private car becomes more dominant within urban areas. “Bundles of qualities”, the physical results of integrated planning that comprises a mix of interventions, must emerge on all levels of planning in order to diminish the problems. Bundling is part of this organization and comprises *large scale pull measures* - urban planning and design measures -, *medium and small scale pull measures*: stimulation of the use of public (collective) transport as well as active ways of transport and *push measures* - reduction of car use (Zandee & Hulleman, 2008). The InfoRio project will focus on the medium scale pull measures by the attainment of a sufficiently high standard of public transport in urban areas through the use of a Personal Real Time Travel Information (PRTTI) concept for public transport, InfoRio¹.

Expected effect of InfoRio is thought to be the improvement and competitiveness of public transport in comparison to the private car. InfoRio is a first attempt to offer discretionary travelers – that have the choice to travel by car or transit - some of the non functional attributes that make the private car such a success. Focus is to retain customers in the bus-system by preventing the discretionary traveler to switch from the bus to the car or any other low occupancy vehicle through the improvement of the transit service.

More specifically a PRTTI system is expected to decline the decrease in the number of passengers transported per vehicle per day in Brazil. Halfway the nineties every bus transported on average about 600 passengers per day whereas this is nowadays about 467 passengers per day although there is a slight trend of recuperation (ANTP, 2008) .

The innovation of the system is the fact that neither users nor public transport operators have to pay for the reception of the PRTTI alert, which is expected to be financed by advertisements. However in order to attract the interest of the public transport operators to participate in the implementation of the service and of potential advertisers to support the funding of the service it will be necessary to get a realistic estimation of the expected demand for the service.

This paper describes the development of a market research method in order to establish the potential demand. It consists of a short review of quality aspects of public transport and the InfoRio information system, a more detailed insight in repeated travel behavior and a method to predict consumer behavior, the preparation of a survey and a description of the potential target group for the information system and finally the results of the method.

¹ InfoRio, is made possible with support of Transumo. Transumo (TRANSition SUstainable MObility) is a Dutch platform for companies, governments and knowledge institutes that cooperate in the development of knowledge with regard to sustainable mobility.

Framework for service quality of public transport

In this section a model is presented with the objective to identify the relevant quality attributes of transport modes and services and to establish to what extent information services can contribute to this service quality perception of the discretionary user.

Beirão & Sarsfield Cabral (2007) Indicate that service quality is perceived as an important determinant of users' travel demand. Yet the measurement of service quality remains a challenging and important research area with practical implications for service providers. Considering public transport, both operators and authorities need to understand how consumers evaluate the quality of the service.

We shortly elaborate on a practical framework for the customer evaluation of service quality of public transport that helps us to understand what improvements a PRTTI system could mean for the service quality of public transport.

To become more attractive for their actual and potential clients, public transport needs to render service levels that might be expected of professional operating service providers. In a study about quality attributes in 26 articles about transit Forte & Bodmer (2004) established that nine attributes are determinant for the mode choice of commuters and they identified some 118 quality characteristics of transit. The nine identified attributes are Accessibility, Frequency, Reliability, Travel time, Comfort, Price, Safety, Customer care and Communication and information. In Vonk et al (2009) we suggest to substitute *customer care* by "ease of use" based on (Dziekan, 2008). This result in the following definitions of quality attributes for public transport, see table 1.

Table 1: Quality attributes of public transport (Vonk, Hulleman, Bodmer, & Berkum, 2009)

Quality attributes	Definition
<i>Accessibility (availability in space of a mode)</i>	<i>easiness of access to the transport system and the activities</i>
<i>Frequency (availability in time of a mode)</i>	<i>Index of occurrence of the transport service within the time interval</i>
<i>Reliability</i>	<i>Minimization of uncertainty of the commuter in relation to the effective service delivery according to pre defined requirements.</i>
<i>Travel time</i>	<i>Period necessary to fulfill necessary activities for the displacement between an activity and another one.</i>
<i>Comfort</i>	<i>Material welfare referring to the service offered, in relation to the expectations of each one</i>
<i>Price</i>	<i>value established by a political decision based on contractual definitions and/or skillful analysis</i>
<i>Safety</i>	<i>Confidence of the commuter that he will be protected against accidents that will affect his physiological or psychological integrity</i>
<i>Ease of use</i>	<i>The degree to which travelers spend affective and cognitive effort on a journey by public transportation.</i>
<i>Communication & information</i>	<i>Information that customer receives, through different communication media, about the transit company contributing to his perception of the service and company</i>

(Reinders, Hagen, & Frambach, 2006) developed a conceptual model in which they determine how different attributes influence on the perception of different transport modes. This model diversifies transport attributes in functional (so more economic) and hedonistic attributes of a service.

The hedonistic advantages and disadvantages are more related to the sensation and the perception like the fun or anger that someone experiences when dealing with a certain service.

The user objectives that are considered important are different for every individual customer. To structure these different user aims a hierarchy can be used, based on the 'customer desire pyramid'. In this pyramid "safety and reliability" form the base. These are the so called basic requirements. If these requirements are not met people will not start making use of a service. *Travel*

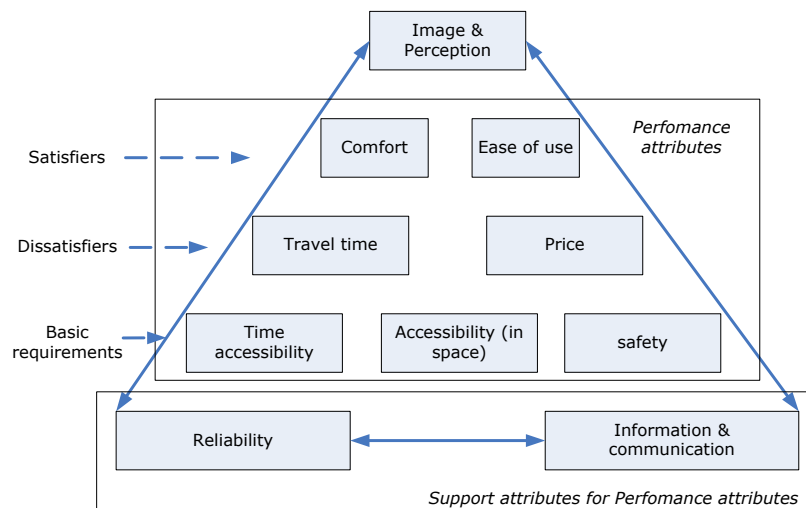


Figure 3: Principle Public transit quality attributes (Vonk, Hulleman, Bodmer, & Berkum, 2009)

time and *ease of use* are dissatisfiers: if these don't match the customer wishes the customers are not satisfied. However if they do match the customer wishes this doesn't mean that the customer is directly satisfied. The satisfiers comfort and perception do contribute to the satisfaction of the customer. If these aspects are not provided the customer isn't directly dissatisfied. After the analysis of Reinders and (Li, 2003) it is expected that a resulting quality attribute "image & perception" must be added.

Figure 3 presents the expected relation between these attributes in *performance attributes* of a transport mode and the *support attributes* – *reliability* and *information & communication* - that support the performance attributes to create the resulting *image and perception*. This *image and perception* is partly dependent of the customer's experience and expectations.

Travel episodes

Littman (2008) presents a table in which he presents a travel time cost reduction classification in which the reductions are divided per part of the trip chain. Li (2003) calls this the episodes of urban commute experience or the journey episodes and identifies the, *Access, wait, ride, and transfer episode*. In Vonk et al (2009) we show that the classification of factors that affect the travel time costs – or more general the transit experience – and the separated legs of the trip chain seems an interesting approach since it makes clear what the commuter thinks important in his travel experience and it will identify where the transit operator can achieve cost-effective transit service quality improvements.

As mentioned before it is also expected that a commuter has a certain type of before trip overall image/perception of a transport mode and that his *on route experiences* confirm or change this image and his perception. Therefore it is suggested to include a resulting or aggregate travel category. The total trip impression: the overall *commuters evaluation* and image and perception of the travel mode attributes. The commuter has this perception before the trip and his on-route experience confirms or turns this perception better or worse.

Table 2 gives a schematic overview of the classification of the quality attributes per journey episode and the resulting total trip impression. It must be stated that the support attributes, *reliability* and *information and communication* can support each of the performance attributes. The reliability of the frequency for example has great impact in the wait episode and on the total trip impression. In line with Beirão & Sarsfield Cabral (2007) different user segments evaluate the same service quality area differently and their satisfaction will be influenced by different service attributes. Also, the needs, beliefs and expectations of users will vary significantly between different segments of the market.

Table 2: Classification of travel mode attributes in performance attributes per travel episode

	Acces, egress & transfer episode;	Wait episode	In vehicle transit trip episode		Total trip impression = Perception
Quality dimension of PT for customer	Quality attributes of PT for customer	Quality attributes of PT for customer	Quality attributes of PT for customer	=	Quality elements of PT for customer
	+	+			
Accessibility	xxxxxxx	xxxxxxx	xxxxxxx	→	xxxxxxx
	xxxxxxx	xxxxxxx	xxxxxxx		xxxxxxx
Frequency	xxxxxxx	xxxxxxx	xxxxxxx	→	xxxxxxx
	xxxxxxx	xxxxxxx	xxxxxxx		xxxxxxx
Travel Time	xxxxxxx	xxxxxxx	xxxxxxx	→	xxxxxxx
	xxxxxxx	xxxxxxx	xxxxxxx		xxxxxxx
Price	xxxxxxx	xxxxxxx	xxxxxxx	→	xxxxxxx
	xxxxxxx	xxxxxxx	xxxxxxx		xxxxxxx
Safety	xxxxxxx	xxxxxxx	xxxxxxx	→	xxxxxxx
	xxxxxxx	xxxxxxx	xxxxxxx		xxxxxxx
Comfort	xxxxxxx	xxxxxxx	xxxxxxx	→	xxxxxxx
	xxxxxxx	xxxxxxx	xxxxxxx		xxxxxxx
Ease of use	xxxxxxx	xxxxxxx	xxxxxxx	→	xxxxxxx
	xxxxxxx	xxxxxxx	xxxxxxx		xxxxxxx

From this table it becomes clear that the private car has a competitive edge in comparison to the public transport on a lot of attributes in several episodes. In travel by the private car the attributes in the *access, egress and transfer episode* and the *wait episode* are small and most of the time not really considered as barriers (disadvantages). The time perception model Li (2003) suggests that unreliable services are evaluated as extremely undesirable by urban commuters, because the travel time is perceived as unreasonably long. The negative evaluation is likely to be coupled with failure in goal attainment, for instance, due to delayed arrivals. This is in contrast with the auto commute experience in which, under normal road conditions, the driver has control over the departure time, route choice, speed used, and even the arrival time, as conformed to the commuter's expectation. The comparative disadvantage on commute reliability or predictability of public transportation may be one reason that continues to motivate urban commuters to use the private car. Service reliability

is, therefore, extremely important in retaining or attracting urban commuters to public transportation (Currie & Rose, 2007). Research of Koolen & Tertoolen (2006) showed that the principal reason for choice users to the use of transit when they possessed a car was the availability and cost of a parking lot, thus a barrier in the access and egress episode. Moreover especially on the hedonistic aspects, as presented by Reinders et al (2006) or image and perception aspects as we suggest, the private car has a competitive edge over public transport.

The support attribute *information and communication* fulfills an important role to mould this image and perception. Especially in the *access, egress and transfer episode* and the *wait episode* information can have an important role in a better overall quality perception of a public transport service. This becomes even more obvious through the explanation of Ongkittikul (2006) who indicates that the production of the public transport service is a process of transforming inputs (such as staff, vehicle and energy) into outputs (such as distance covered by the fleet, distance covered by each seat in the fleet, or hours of vehicle operation). These outputs – the supply related outputs- will be available to potential users. However, since these outputs are services, they can neither be stored nor produced under client order and therefore the service provided must match instant client needs. As a result, the potential users can become actual passengers only if the service meets their demands. It is obvious that information is important in order to increase the chance that this match is made. That is why we consider information, just as reliability as a support attribute.

Comparison of model with reality

In order to check whether the model presented in the previous paragraph and the potential role for travel information are relevant for the Brazilian situation we compared the model with the results of a semi structured interview executed by Fetranpor (2009) among 400 public transport users.

The FETRANSPOR research had the objective to determine the image of public bus transport. What becomes obvious is the big importance customers attribute to:

- Punctuality /Small waiting time
- Not so crowded
- General customer service (air-conditioning and cleanliness)
- Well preparedness of the drivers/conductor.

Table 3 presents the results. In this table it must be observed that in some of the reply opportunities punctuality and small waiting time had been joined in the questionnaire. To take care of this in the results these values have been equally divided over the quality attributes. Given the fact that it is expected that InfoRio will contribute to, a reduction of waiting time and improvement of punctuality, as is explained in the previous paragraph, and in the future might as well improve the match between demand for seats and the supply for seats it is thought that there is a big latent need for InfoRio. Therefore the motivation of customers – see next paragraph is expected to be high.

Table 3: Overview of important quality attributes for PT (source: Fetranspor (2009))

	aspects considered in the PT travel choice (spontaneous)	aspects considered most important in choosing between PT modes (stimulated)	aspects considered most important in using bus (stimulated: 1 = most important - 9 = least important)	Improvements that should be made in the buses (spontaneous)	Most important improvements that should be made in the buses (stimulated)
well prepared drivers/conductors	14,50%	13,50%	3,64	19,85%	20,33%
punctuality	15,75%	12,25%	2,59	6,62%	12,42%
comfortable seats	11,75%	10,00%		19,12%	10,00%
small waiting time	8,50%	9,50%	2,59	6,62%	12,42%
not so crowded / less people in feat	4,50%	9,00%	3,41	14,71%	22,50%
fast / small travel time	13,00%	7,25%		0,00%	0,00%
less assault	6,25%	6,50%		0,00%	0,00%
price	7,50%	4,25%		0,00%	0,00%
accept the electronic billing chip card	5,00%	2,25%		0,00%	0,00%
accept customers that travel for free	1,00%	0,75%		0,00%	0,00%
other/ no alternative	6,00%	11,50%		0,00%	0,00%
accessibility	6,25%	12,50%	3,23	11,03%	0,00%
general customer service	0,00%	0,75%	, 6-8	22,06%	22,33%
	100,00%	100,00%		100,00%	100,00%
total respondents	400	400		389	389

Information system: InfoRio

Chorus, Molin & van Wee (2006) show that providing travelers with relevant information on travel options is generally acknowledged as having the potential to change their behavior in ways that are beneficial to the efficiency of the use of the transport system. Services providing such information – Advanced Travel Information Systems (ATIS)- are widely available nowadays for travelers, and are becoming more advanced every year. Due to technological inventions, Geographical Positioning System, wireless communication through GPRS, 3G etc and the wide-spread huge availability of mobile communication devices like mobile cell phones and a variety of internet applications have generated lots of opportunities for improvements in the Urban Public Transport Service.

In Vonk et al (2009) we showed the system outline and the theoretical advantages of InfoRio- a personalized public transport information concept- oriented on the Brazilian customer.

For the discretionary traveler in Rio de Janeiro the InfoRio system is easy to use. In order to receive information about his Public Transit service the customer must register via internet or by sending an SMS. A few minutes before his trip he will receive a SMS informing him the dynamically estimated time of arrival of his bus service at the desired bus stop.

It was recommended that the system must provide Unimodal Travel Information - related to one travel mode - and makes use of personal distribution channels –i.e. not collective channels.

Concerning the content InfoRio will inform the choice travelers about travel times of their own trips since right now no time schedule is available and the traffic situation is sensitive to congestion resulting in unreliable travel times. Minimal requirement is that participation bus companies must have dynamic GPS location data available to be able to determine the Real Time Travel Time. The service must be launched and focused on the choice traveler who

frequently uses internet and mobile phones. In relation to the trip purpose he needs to be a “must traveler” and preferable in the peak period.

Another important aspect for the distribution is that the service must be free of cost and effort for the users since willingness to pay for travel information is generally found to be very low and also the usability of RTTI plays an important role, which signals that travelers are generally willing to only bear very little costs in terms of effort, time and money in order to receive travel information through RTTI systems (Chorus, 2007).

In relation to the funding of the PRTTI system one has to take into account that the following processes have to be financed: the data collection, the data processing and the data distribution.

With regards to the RTTI financing models applicability and suitability for InfoRio, the following is expected:

- European business models (public sector financed) are not suitable, since the Brazilian government is not expected to finance such an RTTI service as InfoRio;
- Contracts with telecom operators can be interesting, with regards to financing the distribution of the InfoRio's;
- Advertisements can be included in the InfoRio to gain revenue and finance the InfoRio process.

The service is expected to offer the choice traveler besides some functional advantages – reduction of waiting time at bus stop and a more “door to door” experience and also some hedonistic advantages since the service is personalized and therefore the customer might experience the sensation of pleasure or fun and/or a sensation of independence and he might get more control over the transaction. The system is expected to have impact on the “*wait episode*”- reduction of waiting time and more control- and on the *access, egress and transfer episode* -with the information he can choose to speed up his access trip or to take it easy and make use of the next bus, so augment the feeling of control.

For the public transport operator InfoRio is interesting since it offers a tool to implement Relationship Marketing enabling him to render more profitable services to its customers and the importance of frequency and price as the most important attributes for service choice diminishes.

Conclusion

Conclusion of the research is that there is a significant potential for InfoRio, considering customers' and operators' perspectives since the service will improve the quality level of public transport for customers and supplying the operator with a tool to implement Customer Relationship Marketing that enables him to increase his profitability. However, before the system can be launched and implemented a market analysis must be executed in order to convince both public transport operators and advertisers of the potential of the system. This will be prepared in the next paragraph.

Customer and travel behavior research theories

This paragraph will elaborate in more details about travel choice behavior and the Triade model - a practical method to determine potential demand- and market research methods.

Travel behavior

Understanding travel behavior and the reasons for choosing one mode of transport over another is an essential issue. However, travel behavior is complex. For each journey, people have the choice between different transport modes, each one having specific characteristics, advantages and disadvantages and costs. Additionally the choice of one specific transport mode can vary over time and with the type of journey (Beirão & Sarsfield Cabral, 2007).

The most widely applied model of cognitive determinants of travel mode choice is the Theory of Planned Behaviour (TPB) which suggests that behavior is most closely determined by an intention to act, which summarizes motivation. The TPB offers a reasoned account of behavior which assumes that driving arises from deliberation over the advantages and disadvantages of available transport options, and the utility of intention for predicting transport behavior. These motivational studies however neglect the often repetitive nature of travel mode decisions, because frequently repeated behaviors may become habituated and thus automated.

Thøgersen (2006) argues that most travel mode choices are repetitive and made in a stable context. He proposes a simple, but comprehensive conceptual framework for studying repetitive transport behavior of the use of public transport, as it unfolds under normal circumstances, in everyday. He limited his research to determinants that have a fairly direct influence on travel mode choice and assumed that travel mode choices are partly volitional (i.e., influenced by the traveler's evaluations and motives), partly determined by individual (e.g., transport habits, car ownership) and contextual (e.g., the availability of public transportation) constraints. The author traced travel mode choices back to three generic co-determinants of behavior:

- the traveler's evaluations and motives,
- individual abilities (and constraints)
- contextual opportunities (and constraints).

He assumed that at least some of these determinants are themselves influenced by (past) behavior. When performing a behavior frequently and in a stable context it may become habitual² and the experience extracted from past behavior may also lead to changes in attitudes and in perceived behavioral control. This is in line with the framework as presented in the previous paragraph.

The research of Thøgersen (2006) showed that a very high temporal stability is revealed for public transport behavior meaning that past behavior is a stronger predictor of current behavior than any of the previously mentioned antecedents.

² What distinguishes habitual processes from the conscious recycling of a previously formed intention is that, in the former case, behavioral inertia is due to some sort of automaticity while, in the latter case, it is a deliberately made choice.

In theories about consumer behavior Nederstigt & Poiesz (2006) describe the same type of decision making proces. The decision making process - to decide whether or not buy or use a product or service - depends of the level of the involvement of the consumer and of the level of experience he has with the product. Table 4 shows the process and shows as well the impact of habit (routine) as presented in the previous paragraph.

Table 4: Decision making proces and relation between level of involvement, experience and need and disposition to obtain information (source: Nederstigt & Poiesz (2006)).

Familiarity with the product	Consumer has no or small experience with the product	Consumer has experience with the product	Disposition to obtain information
Involvement / perceived risk with the decision			
High involvement / many risks perceived	Exhaustive problem solving decision making behavior (buy a car for the first time)	Routine wise decision making behavior (buy same car for the second time)	High
Low involvement / little risks perceived	Limited problem solving decision making behavior (buy a new type of washing powder)	Routine wise decision making behavior (buy washing powder you always buy)	Small
Necessity to obtain external information	High	Small	

What is important for this research is that a segmentation might be made about the effect of the InfoRio service on the customer. The following segmentation is suggested:

- customers will not use the InfoRio information service;
- customers that use public transit at a regular or irregular basis will use the service to make a choice - reasoned behavior - to take the bus / the next bus or choose an alternative;
- customers that have the habit to use public transit will include the reception of the InfoRio alert in their habit pattern.

As mentioned understanding travel behavior and the reasons for choosing one mode of transport over another is an essential issue. However our objective is to make a prediction of the potential demand for the service. The following paragraph will present a method to establish potential demand for new products or services developed by Nederstigt & Poiesz (2006) that is in line with the framework proposed by Thogersen.

Method to predict consumer behavior analysis: Triade model

According to (Nederstigt & Poiesz, 2006) the analysis of consumer behavior starts with the specification of the criterion behavior. The ultimate criterion behavior in marketing is the purchase of a product, a service or a brand. In a real behavior analysis one tries to explain the steps that resulted in the criterion behavior. To do this different stages in the behavior are identified that might result in the purchase and every behavioral stage will be object of study.

After the behavior is defined, at the level of interest of the marketer, one needs to define the constraints: *determinants of behavior that define the free choice area of the consumer.*

After the determination of the *Criterion behavior* and the *constraints* the other part of the variation in behavior of consumers – *the free choice area* – one tries to explain by using psychological concepts.

One has the opportunities to elaborate these concepts on different levels – from very generic to very specific.

The variation in the free choice area depends of the following main concepts:

- Motivation: values, needs, involvement
- Perception: observation, interpretation, image
- Learning: information processing, knowledge, experience, feedback
- Attitudes: affect, emotion , brand & image

These main concepts are interrelated.

The advantage of this model is that it includes the relevant concepts and indicates their relations. However, this is also a disadvantage: everything is interrelated. Therefore the model can be better used to describe the behavior and the backgrounds of this behavior than to explain, to predict or to influence this behavior. The Triade model is a more simple representation of the different influences that have an effect on behavior. This model is developed on behalf of the practical environment and is based on the fact that decision makers (consumers) normally decide on at maximum three aspects, even if they think that more aspects are relevant.

The Triade model assumes that a consumer/person before deciding to exhibit or not exhibit a certain type of behavior makes a quick and unconscious evaluation of his motivation, capacity and opportunity to exhibit this behavior. Three subjective evaluations can be represented on a scale, each from 0.0 till 1.0. Although the estimation of these values seems difficult, practice shows that this is not the case and that it forces people to think about the main reasons for a certain type of behavior. This doesn't guaranty that everybody agrees over the values but by using more discussion or even more research one can clarify this. The Triade model states that the three factors are of effect at the same time. In predicting or explaining the behavior we cannot forget one of these factors.

The central thought of the Triade model is that the probability of the criterion behavior depends of the product of the values of the three factors.

The Triade model describes the decision making process of consumers. Three variables, motivation, capacity and opportunity are used to describe the likeliness of the consumer to purchase, or in this case use, a product or service

Motivation is defined as the extent to which there is an interest in showing behavior X.

Capacity: the extent to which the consumer possesses the skills and characteristics and direct tools to show behavior X. Capacity is divided in physical capacity, mental capacity and financial capacity.

Opportunity: the extent to which the circumstances outside the consumer make behavior X possible.

The likeliness of a consumer to buy or use a product/service is:

$$T\text{-value} = \text{Motivation} * \text{Capacity} * \text{Opportunity}.$$

The value for T is not the actual chance they will buy or use the product or service, but it gives an idea about the likeliness.

With the help of the Triade model it is possible to identify where marketing measures should focus on to augment the probability of a certain, desired consumer behavior.

Sometimes a low value on one factor can be compensated by a high value on another factor. Important with the Triade model is to realize that one should first identify the behavior to analyze before one determines the values on the factors.

For this research the Criterion behavior will be that the end user will have to use the InfoRio service, and his motivation, capacity and opportunity to do so will be determined in order to be able to determine the potential market for InfoRio.

Customer research & expected target group segmentation

This paragraph will deal with the segmentation based on theoretical aspects that will be confirmed through a survey and a focus group research.

Segmentation is the division of a population into smaller, relative homogenous groups.

InfoRio gives a commuter positive information about his trip and it leads to shorter waiting times and a door-to-door experience.

Verhage (1994) uses six segmentation steps. (1) Market composition describes the market where the producer will operate should be defined. (2) In the understanding of needs the motivation of consumers to start using the InfoRio service should be established and categories of customers with the same needs are identified. (3) Through the selection of the segmentation variables we explore which characteristics the consumers in the distinctive categories, formed in step 2 share. (4) In the market division the chosen segmentation variables are used to create the segments. These segments can be described by a profile. (5) In the end one or a few specific segments should be chosen as target group. In the calibration of the marketing mix to target (6) one decides over the positioning of the product, choosing the right combination of the marketing mix elements for the target.

Market composition

Krizek (2007) presents travel market segmentation which is a unique way to understand the transit market, and the types of populations who comprise the current and potential transit market yield a different perspective on an age-old phenomenon and give insight in their size and the preferences of different populations. Krizek makes the segmentation principally based on the commuter type and its travel frequency—irregular or regular – and whether a person is a transit user or a car user and within these segments whether a person is a captive or non captive user, see figure 2.

Furthermore a distinction in regular and irregular travelers is made since regular and irregular users have different preferences towards the variables that Krizek used.

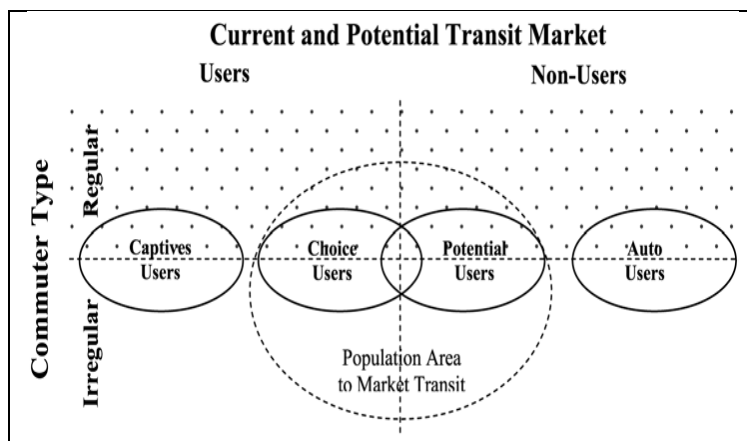


Figure 1: Overview of current and potential transit market (source: Krizek (2007))

Reinders et al (2006) made a further distinction in relation to trip motive by identifying lust and must travelers and distinct segments by the consumption time: in peak or off peak. It is interesting to see that in OECD countries the focus of public transit planners is to get the potential user out of the car and make him a choice user to augment the modal share of transit whereas in for example Rio de Janeiro - with still a high modal share of transit the focus is – or must be- to improve the service in order to maintain ridership of the choice user since these tend to look for other modes (Vonk et al, 2009).

Understanding the attitudes and preferences of the target group is an important aspect to retain current riders and to attract new ones by providing quality service that addresses the needs of especially the discretionary riders. Chorus (2007) indicates that due to habit it is much more feasible to try to keep persons in their actual mode then to try to achieve a modal change, this is in line with the repetitive travel behavior observations of (Thøgersen, 2006). Therefore the objective to retain the discretionary choice transit user for public transit seems a feasible objective.

Choosing the target group and select segmentation variables

(Thøgersen, 2006) showed that targeting means that, rather than trying to reach everyone all the time, the information should be targeted at the individuals that are most motivated to attend to it, at the exact time and place where they are most motivated to attend to it (usually when they need it). His panel study showed that attitudes towards using public transport and perceptions about its ability to fulfill one's transport needs are influenced positively by the use of public transport.

The InfoRio PRTTI service must be launched and focused on the choice traveler that frequently uses internet and mobile phones. In relation to the trip purpose focus must be on the must traveler and preferable in the peak period.

In this paragraph we will determine segmentation variables in order to be able to select the above mentioned segment.

In the past years several researches investigated the travel behavior of people. Some of these researches tried to predict how people make their travel mode decision. As mentioned, Krizek has determined eight groups for segmentation. However, these groups are not sufficient to say something about differences in demand for the InfoRio service. Reinders, Hagen & Frambach (2007) show differences in demographic and psychographic characteristics in relation to the attitude towards Self Service Techniques (SST's). Reinders researched the relation between personal characteristics and psychographic characteristics. The following psychographic and personal characteristics were used:

- psychographic characteristics: self efficacy, Need for interaction, Fear of technology, Experience with technological 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)

In his research Reinders perceived the same patterns in outcome. People with a high self efficacy often do not need interaction, do not have fear of technology and have experience with technical products and vice-versa, meaning there is a correlation between the psychographic characteristics.

Reinders' research did not show significant differences between men and women. Men showed less fear of using a technology and women showed more confidence. On the other characteristics no differences were found. This is in line with other studies showing contrasting results between women and men with some [e.g. Petrella & Lappin (2004)] indicating that men use information and technology more than women and others [Flake (1991) indicating the opposite. Therefore we expect that there will be no difference between the use of men and women.

Moreover Reinders indicated that 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 and are therefore more likely to use a Self Service Technologies.

Reinders also looked at the relation between the personal characteristics and demonstrated that the psychographic and personal characteristics are correlated. Must travelers are often heavy users, high educated, young and with a high income. These people might also be the group that is most interested in the InfoRio service.

In addition the contextual opportunities (and constraints). that are proposed by Thøgersen (2006) will have an influence on the use of InfoRio. 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 InfoRio more to shorten their waiting times. When it rains people do not like to stand in the rain, so the weather might also be an important variable.

Finally 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. This is also important information as users of InfoRio at least should have a mobile phone and preferably access to internet.

The variables that will be evaluated can be put into three categories: personal information, situational information and trip related information. The variables in each category will lead to different motives for using InfoRio (or not using it). And in this way segments with useful information about the different types of travelers will be created.

- Personal information: Gender, Age, Income, Education, Heavy/light traveler (like Krizek's regular/irregular), Technology use;
- Situational information: Distance to bus stop, Feeling of safety at bus stop, Peak/off peak, Frequency bus, Weather;
- Public transit use
 - Trip information: Must/want trip, Length of trip;
 - Attitude towards the bus.

Expected early adaptor segment

In the previous paragraph we established the question categories that are thought to be of influence on public transport information need. In this paragraph we will select the segmentation criteria - questions and scores - that will be used to identify the Motivation, Capacity and Opportunity of the participants to exhibit the desired criteria behavior: *Register cell phone number and use InfoRio as information system for their daily commute trip.*

As mentioned we think the following segmentations among captive and choice travelers of public transport will be identifiable: (1) customers will not use the InfoRio information service; (2) customers that use public transit at a regular or irregular basis will use the service to make a choice - reasoned behavior - to take the bus / the next bus or choose an alternative, (3) customers that have the habit to use public transit will include the reception of the PRTTI alert in their habit pattern.

In the following tables we elaborate what is the expected result for each segmentation on the Triade score. Once again it is stated that the total score on motivation, capacity and opportunity is important to determine whether one is a potential InfoRio user. So on one hand the InfoRio service should improve the situation of the traveler on the points that are important to the traveler (motivation) and on the other hand the traveler should be interested and able to use a technology like InfoRio (capacity and opportunity). When these three conditions are met the traveler is a potential user of the service. In the following tables we present the questions that are used to determine the motivation, capacity and opportunity for the persons to start using the InfoRio service. For each of the three segments we have indicated the expected answers and the resulting score on the Triade scale.

Motivation

People should feel that using the InfoRio service benefits them, for example through a reduction in their waiting time or the feeling that they are in control. In the Triade model motivation is related to the purchase of a product or service, however for InfoRio not only the behavior of using the service is important for the motivation, also the behavior of traveling should be taken into account.

Table 5: Questions & scores to determine Triade score for motivation

Motivation		Expected answers of categories					
		Non users of InfoRio		Choice use of InfoRio		Habit user of InfoRio	
Aspect		answer	Tr score	answer	Tr score	answer	Tr score
Actual use	Use of bus for their must/lust trip	Must	2	Lust	1	Must	2
	Frequency of use	>3/week	2	<2/week	1	>3/week	2
	Reason to use the bus	Negative choice: Lack of alternatives, Cheapest	1	Positive choice: Fastest, Easy Access, Safer, more comfortable	5	Positive choice: Fastest, Easy Access, Safer, more comfortable	5
Attitude	Recommendation of service to others/	No	1	Yes	3	Yes	3
	Do you have a driver licence / Do you have a car	No/No	1	Yes or No /Yes or No	2	Yes or No/ Yes or No	2
Information need	Importance of arriving on time	Totally don't agree /don't agree / neutral	1	Totally don't agree /don't agree / neutral	1	agree / totally agree	5
	Did you already look for and found info about correct bus line to destination	Totally don't agree /don't agree / neutral	1	Agree /totally agree	2	Agree /totally agree	2
	Did you already look for about when your bus leaves from bus stop	Totally don't agree /don't agree / neutral	1	Agree	3	totally agree	5
	Do you want to have more information about when bus will arrive	Totally don't agree /don't agree / neutral	1	Agree /totally agree	5	Agree /totally agree	5
Triade Motivation score		0-15	11	16-25	23	> 25	31

Capacity

People should have a mobile phone to be able to use InfoRio and preferably access to Internet. This is the physical capacity. Mentally they should be able to understand how the service works and how they can receive their information. Financial capacity is less important, because consumers will not have additional costs. Only the costs for a mobile phone or internet connection could be used, but it is not expected that people without a mobile phone think about purchasing one because they want to use InfoRio. In order to determine whether participators have the skills and characteristics to use InfoRio questions will be asked in relation to physical capacity. In relation to mental capacity it is expected that younger persons, with a higher level education and more need to plan their activities have a higher probability to use InfoRio.

Financial capacity: although in the pretended business model for InfoRio the end customer (public transport user) doesn't have to pay for InfoRio it is expected that financial capacity determines ones attitude towards a transport mode. If one has more financial resources (>R\$ 2000,-/month) and use public transport persons are expected to have a more positive attitude towards public transport.

Table 6: Questions & scores to determine Triade score for Capacity

Capacity		Expected answers of categories					
Aspect		Non users of InfoRio		Choice use of InfoRio		Habit user of InfoRio	
		answer	Tr score	answer	Tr score	answer	Tr score
physical capacity	possession of cell phone and internet	Yes/no	0	Yes	1	Yes	1
	possession of internet	No	0	Yes	3	Yes	3
	Financial capacity	< R\$2000,- / mes	0	> R\$2000,- / mes	3	> R\$2000,- / mes	3
Mental capacity	academic level or are at university	No	1	Yes	5	Yes	5
	Age	> 40	1	< 40	3	<40	3
Triade Capacity score		<5	2	>5	15	>5	15

Opportunity

People should have the opportunity to send information about their trip. There should be phone coverage so the mobile phone can send and receive information. The more situational related information is thought to be an important indicator for the opportunity people have to start using InfoRio the following aspects will be included for this. Distance to bus stop: indicated by the average waiting time for the bus. Frequency bus: if persons perceive the frequency of the bus as fast this indicates that they don't consider the waiting period as a problem. Feeling of safety at bus stop: an unsafe feeling at the bus stop is thought to be a positive incentive for use of InfoRio that gives people more control over their situation.

Table 7: Questions & scores to determine Triade score for Opportunity

Opportunity		Expected answers of categories					
Aspect		Non users of InfoRio		Choice use of InfoRio		Habit user of InfoRio	
		answer	Tr score	answer	Tr score	answer	Tr score
Distance to busstop (waiting time)		< 10 min	1	> 10 min	3	> 10 min	3
Perceived frequency of bus line		Fast	1	Not fast	3	Not fast	3
Feeling of safety at bus stop		<Neutral> <Quite safe> <Really safe>	1	<Not at all>; <Not really>	3	<Not at all>; <Not really>	3
Triade opportunity score		<5	3	>5	9	>5	9

The segments were created based on literature. Now they should be tested in Rio de Janeiro for their suitability. This will be done by conducting a survey.

Survey preparation

In the previous paragraph is elaborated what kind of questions will be used and how these questions will be used to make an analysis of potential demand. This paragraph will elaborate on how the information will be acquired through quantitative research or qualitative research and through stated preference or through revealed preference questions.

Train (2008) indicates that stated-preference (SP) choice experiments are used extensively in economics and public policy. In standard sp experiments, the alternatives are constructed without regard to the respondent's choice in the revealed preference (RP) setting. However, researchers have also developed sp experiments on the basis of the respondent's (RP) choice. The advantages of sp-off-rp questions are that they are easy for the respondent to

understand and contain a realism that might not be attained by either standard and pivoted SP experiments, since respondents face the same choice situation with the same alternatives in the SP-off-RP questions as in the RP setting. Since Thøgersen (2006) showed that a very high temporal stability is revealed for public transport behavior meaning that past behavior is a stronger predictor of current behavior than any of the previously mentioned antecedents it is decided that RP will be used in order to determine the use of information systems and some stated questions in order to determine the attitude towards public transport and public transport information.

According to Beirão & Sarsfield Cabral (2007) qualitative methods are a powerful tool to explore those complexities, since they allow a grasp of the individual's own explanations of behavior and attitudes. One of the major trade-offs between quantitative methods and qualitative methods is a trade-off between breadth and depth. Quantitative approaches have the advantage of measuring the reactions of many subjects to a limited set of questions allowing the comparison and statistical aggregation of the data. On the other hand, qualitative methods produce a wealth of detailed data on a small number of individuals. Qualitative methods have the advantage of allowing people to express what is really important to them in their own words. Research on travel behavior using qualitative methods has provided new insights into this field, allowing a better understanding of transportation problems. It is expected that a quantitative survey to create the categories of potential users followed up by a qualitative focus group research to determine the attitude of persons in relation to the information service is appropriate for our objective.

This further research consists out of a survey (quantitative), consisting of revealed preference questions and a focus group session (qualitative). The survey makes use of revealed preference questions and has the objective to select persons of the segmentations as created in the previous paragraph in order to invite these segmentations for a focus group research. This qualitative focus group research enables us to gain insight into the underlying customer evaluations and attitudes towards public transport, their information need and their opinion about InfoRio.

Execution and results of Market research InfoRio

The survey was conducted at Bendrix, a company in Rio de Janeiro.

A pilot survey was executed with 40 employees, all public transport users, in order to be able to define the profile of the segmentations that will be used for focus group session.

The pilot survey and the focus group had the objective to select the segment with the highest chance to register their cell phone number and use InfoRio as information system for their daily commute trip.

Final objective is to get deeper insight in the need and effects of InfoRio and the potential demand to use the InfoRio information system.

Results of survey

Respondents show different attitudes towards receiving more information: some people don't need more information whereas others would like to have more.

There is a difference between must and lust travelers. In general respondents would like to have more information for their lust trip, simply because they have to wait longer for this trip. Respondents feel very unsafe at the bus stop and overall do not think that traveling by bus is attractive.

Associations between personal and trip related characteristics on one side and on the other side the need for information are identified. Also a technology score is used. This score consists out of mobile phone and internet use. The higher the score the more technology adapted a person is.

The highest association was found between the age and the need for information, indicating that younger people have a higher interest in receiving information.

The difference in correlation between the waiting time for the must and lust trip and the need for more information is noticeable. Important result is that a lot of people would like to have more information about the buses. Waiting times at the bus stop often take over fifteen minutes.

The survey showed that at the moment very little information is available about the bus timetable. All respondents use the bus to go to work, school or university. The average travel time and the waiting time are striking. People show different attitudes towards receiving more information: some people do not need more information whereas others would like to have more.

The intention was to use the survey to identify and select young persons (younger than 40), must travelers with a low frequency of buses at their bus stop; these were thought to have a high Triade score and thus a high potential to use InfoRio.

We could indeed identify the following segmentations according to the segmentation criteria created in the previous paragraph. Persons that will include InfoRio in their habit (nine respondents), Persons that will actually make an explicit consideration whether to take the bus indicated or take the next bus (7 respondents); Persons that will not use the service (24 respondents) ;

It was possible to select nine persons – out of the forty participants - that met the criteria of persons that were thought to have a high Triade score for potential use of the InfoRio service and were expected to included the service in their Habit. From these nine persons, six participated in a focus group research about their use of public transport, their information need and their evaluation of the InfoRio service.

Results of focus Group

After the surveys a focus group sessions was organized to obtain more detailed information about what people think of traveling with the bus and to obtain opinions about InfoRio and potential use. People were also asked about how they would like to use the service.

The nine persons were invited for a focus group session. In the end six persons did really participated in the focus group session. Of these persons five persons were between 20-29 years old and the other one between 30-39 years. Four persons had academic education level, one was studying and one had finished high school. Only one of them had a driver's

license, but this person had no car available at home. Commuting travel time for all participants was at least one and a half hours to get to work.

In the focus group semi structured interview techniques were used in relation to the following subjects:

- Public transport information search;
- Travel information need;
- InfoRio information system.

Information search

In relation to their actual information need all participants indicate that they use internet to get information about which bus they have to use, principally Google Maps. Websites from Rio de Janeiro were not used and not known (rionibus.com.br and vadeonibus.com.br). One of the respondents 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 due to the fact that they perceive that the person who dispatches the bus at bus stations does neither have correct information.

Travel information need

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. In general the participants would like to have as much information as possible, presented in such a way that they can make the best choice.

Participants indicated that they would like to receive more information about whether the bus is a stop service or an express service, travel times, service quality level, the price of the bus trip, if the bus is crowded or not since participants said that they do not like to travel with the bus when they have to stand

People would like to have more information about travel times of the bus, because sometimes they are waiting just a few minutes and other times twenty or more minutes. They would like to have information on departure times so they can organize their day in a more efficient way. They understand that the time of arrival cannot be estimated exactly, because all kind of things that lead to a delay can happen during the trip.

The participants indicate that they prefer a bus with a lower frequency that stops at fewer bus stops. A better accessible Public Transport system is required according to the participants. They see a difference between the quality of Public Transport in Zona Norte and Zona Sul. The frequency in Zona Sul is higher and the quality is better.

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.

InfoRio related questions

The participants were very enthusiastic when they saw the possibilities of InfoRio, especially when one of them received a demo sms. The principal benefit they perceived is the fact that they can better plan their activities and that a reliable service with a reliable arrival time at

their work helps them in arriving on time at their work and not half an hour in advance as they arrive right now in order to prevent that they are being fired.

Respondents 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. The participants 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.

Respondents thought it reasonable to pay for the service. They suggested several ways of payment like payment per message (R\$ 0,35 cents per SMS), payment per SMS package or service for free including advertisement although the common remark was that they prefer to pay because then they would have the right to complain.

In relation to the indications of bus stops participants prefer 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 know the numbers of the bus stops. All of them know the number of their bus line.

The participants would like to have information about all the modes, not only bus, but also the train, metro and bus. For irregular trips they would like to be able to call a call centre to ask information and they would use the website for their regular trips and the telephone (sms or call with call centre) for their irregular trips.

The website should be easy to use. So people should be able to indicate from where to where they like to travel and when they would like to do this. It should be clear what time they need to use, time they are leaving home, time of arrival of bus at the bus stop or time of arrival at end point.

Conclusion and recommendations

The survey showed that at the moment very little information is available about the bus timetable. All respondents use the bus to go to work, school or university. The average travel time and the waiting time are striking. People show different attitudes towards receiving more information: some people do not need more information whereas others would like to have more.

It is concluded that the proposed segmentation criteria that resulted in the selection of nine persons with a high Triade score works well as a segmentation. We were able to identify out of a sample of forty respondents:

- **Nine** persons that are expected to include InfoRio in their Habit; and will register for the service, receive a message and go to bus stop
- **Seven** persons that will actually make an explicit consideration whether to take the bus indicated or take the next bus;
- **Twenty-four** persons that will not use the service;

After a focus group session with the respondents that were expected to include the service in their habit it was confirmed that these persons indeed have a high chance to start using the service. Nine of the forty respondents might use the InfoRio service. At this time it was not

yet possible to invite the respondents with a lower Triade score to participate in a focus group research to confirm our expectations.

It should be noted that the sample is relatively small, thus the results should not be generalized. However the developed method works to select the desired segmentations.

The results of the focus group session showed that the participants were very enthusiastic when they saw the possibilities of InfoRio. The principal benefit they perceived is the fact that they can better plan their activities and that a reliable service with a reliable arrival time at their work helps them in arriving on time at their work and not half an hour in advance as they arrive right now in order to prevent that they are being fired.

We conclude that the developed method consisting out of a revealed preference survey to determine segmentations followed by focus group sessions with the created segmentation groups give a good insight in the market potential of a new service and it is easy to elaborate the research. Especially the focus group session gives a wealth of new insights about the service.

It is necessary to conduct statistically significant 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. Moreover focus group sessions with all segmentation classes should be executed in order to confirm the differences in relation to the information services of the three classes and whether other segmentation classes can be identified..

Next step in the research will be the implementation of the InfoRio system on a bus line in Rio de Janeiro and afterwards the developed method will be used in a start-up measurement before the introduction of the service and in a after introduction measurement in order to determine whether the demand expectations are correct and in order to calibrate the system to the desires of the public transport users.

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