ANALYSING REPEAT VISITATION ON COUNTRY LEVEL WITH PASSIVE MOBILE POSITIONING METHOD: AN ESTONIAN CASE STUDY[1]

Andres Kuusik, Rein Ahas, Margus Tiru
University of Tartu, Positium LBS

Abstract

The purpose of this paper is to investigate the capabilities and limits of the passive mobile positioning (PMP) method in studying loyalty of tourists on the macro level. The repeat visitors were identified using database of call activities of roaming phones in Estonia since 25.04.2005 till 31.01.2009. For this purpose was developed model which selected repeat visits on the basis of time interval.
The findings of the study revealed that it is possible to observe the duration, density, seasonality and dynamics of repeat visitations. In addition the local destinations and events most loved by repeat visitors and the trajectory they are using could be also identified. Another important finding revealed that repeat visitors stay longer in destination than first time visitors. The results presented in this paper could be used by Estonian Ministry of Economic Affairs and Communications and by Enterprise Estonia developing the Estonian tourism policy.

Keywords: loyalty, destination loyalty, repeat visitation, tourism marketing, passive mobile positioning method, Estonia.

1. Introduction

Tourism industry is for most of countries very important branch of economy. For example in year 2006 every second country in EU-27 got over 3 % of GDP from the international tourism receipts and every third country in EU-27 had this proportion even over 5%. Tourism plays even more important role in the new members of EU. – for example in Estonia was in year 2006 proportion of international tourism receipts in GDP 6.2%. (European … 2008) Therefore tourism industry should be given high priority by the government and efforts should be taken in order to prepare a very professional marketing strategy of tourism industry on the macro level. Papadopoulos (1989) has pointed that for a national tourism organisation a well co-ordinated tourism marketing planning process is vital in order to survive and prosper in the tourism industry. During the past thirty years the emphasis of the marketing strategies has shifted from one-shot transactions to long-term relations. (Gummesson 1999) Nowadays the retention of loyal customers is more important than winning new ones. Research carried out by different authors has shown several reasons for that:

- Reduction of marketing costs (Rosenberg *et al.* 1984).

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- Lower customer management costs (Buttle 2004; Reichheld 1993).
- Increasing purchases (Bowen *et al.* 2001; Buttle 2004)
- Reduction of risks (Buttle 2004)
- Positive word-of-mouth (WOM) (Oppermann 2000; Buttle 2004; Petrick 2004; Bowen *et al*. 2001)

Above mentioned reasons are extremely relevant in the tourism industry as well. The increasing number of destination alternatives and thus competition for market share requires destination managers to think about customer retention and how to keep customer returning and continuing to repurchase. On the firm level customer returning is important due to all reasons mentioned above. On the destination region or country level Oppermann (1999) has added that the knowing of the amount and type of loyal tourists helps to forecast the total demand, design infrastructure and create positioning strategy.

Marketing strategy formation presumes gathering and analyzing data. There are two levels of analysis of loyalty: micro and macro (Jacoby *et al*. 1978) The micro level is linked with attitudes answering questions as why customer is loyal and what kind of variables affect his/her loyalty to certain brand or destination. Macro level measures behaviour – the outcome of attitude. Kyle, Graefe, Manning and Bacon (2004) have conceptualised psychological commitment as the attitudinal component of loyalty and an antecedent of behavioural loyalty. Oppermann (2000) suggests use behavioural characteristics of destination visitation for measuring destination loyalty because destination selection and trip planning are high-involved decisions and therefore spurious loyalty (not very positive attitude but high repeat purchase) is little likely to occur. On the country level it sounds quite reasonable suggestion because it should be easier to register quantitative events than carry out qualitative interviews. Nevertheless, conventional quantitative methods are too limited and restricted to answer complicated questions about international tourism flows in a globalising world. For example, the traditional statistics on tourist flows, such as border and accommodation statistics do not provide researchers information concerning the choice of destination or the evaluation of objects of interest and the infrastructure visited. Also, in many European Union (EU) member states as in Estonia, border statistics are no longer recorded. Accommodation statistics often have problems with tax violations in Eastern European and other countries, and overnight stays do not show the daily geographical movement of persons. (Ahas *et al.* 2008) Besides, by the best knowledge of the authors of the current paper only some European countries officially collect data about repeat visitations. Recent developments in information and communication technologies (ICT) such as geographical information systems (GIS) and digital databases are advancing surveying methods in geography and tourism studies. One of the emerging subjects in geographical studies is connected with mobile (cellular) phone positioning datasets and location-based services (LBS) Mobile positioning data has great potential for applications in space-time behaviour studies addressed in studying tourism geography, though there are various restriction and pre-conditions in ICT applications. (Ahas and Mark 2005; Ahas *et al.* 2008)

The objective of this paper is to investigate the capabilities and limits of the passive mobile positioning (PMP) method in studying loyalty of tourists on the macro level and thus bring out new inputs for formation of tourism strategies for regions and countries. Paper is opened by the overview about the previous research on customer loyalty. It follows by the explanation about the PMP method. Third section presents the results of the first empirical attempts and provides the discussion about strengths and weaknesses and further potential of the method. Paper concludes by the tourism policy implications of the proposed method in the case of Estonia.

2. Literature overview

There are multiple approaches to customer loyalty. The pioneering work by Melvin Copeland was published in 1923, which proposed that three types of consumers' attitude toward the brand could be identified: recognition, preference and insistence. In the case of recognition the relation with the brand is weakest: the recognized brand will be selected from the other unrecognized brands or from among unbranded merchandise. In the case of insistence the relation with the brand is strongest: customer accepts no substitute unless it is an emergency. (Copeland 1923) Until 1970 theories of behavioural loyalty (repeat purchase behaviour) were dominating. Some theories considered loyalty as a function of the share of total purchases (for example Cunningham 1956). Farley (1964) has stated, that customer is brand loyal if the number of different brands consumed is low in certain time period. Both Cunningham and Farley and also other authors (Jacoby 1971; Ehrenberg 1974; East *et al*. 1995) have not excluded that customer can be loyal to many brands in the same time. Other theories considered loyalty as a function of buying frequency or buying pattern (Tucker 1964; Sheth 1968) or function of repeat buying probability (McConnell 1968). There are a lot of studies investigating the validity of the statement that the probability of the repeat buying follows the Markov chain approach. According to this approach the probability of the event depends only on the last event and all other event before have no effect. (Harary *et al*. 1962; Sheth 1968) I.e. a customer is brand loyal if his possibility of buying a particular brand at time t, conditional on identical purchase at time t-1, is larger than the corresponding unconditional probability. (Wernerfelt 1991).

These approaches (except Copeland's) looked the brand loyalty as a stochastic behavioural phenomenon. These theories did not attempt to explain why customers behave loyally. Bass (1974) stated that even if behaviour is caused by some variables but the bulk of the explanation lies in a multitude of variables which occur with unpredictable frequency, then, in practice, the process is stochastic. During the late sixties the popularity of stochastic models dropped and some deterministic views on loyalty were proposed. In the year 1968 McConnell tried to prove that loyalty depends on the perceived value of the brand. (McConnell 1968). In the next year Day (1969) introduced the two-dimensional concept of brand loyalty, which stated that loyalty should be evaluated with both behavioural and attitudinal criteria. In his study he showed that 30% of customers who behaved loyally hadn't very or extremely favourable attitude toward the brand. (Day 1969) Jacoby and Kyner (1973) predicted also that repeat purchases of one brand by customers are not

stochastic and there exist variables influencing the customers choice. The approach they proposed is very much used also nowadays: brand loyalty is biased, behavioural response, expressed over time, by some decision-making unit, with respect to one or more alternative brands out of set of such brands and is a function of psychological (decision making, evaluative) process. (Jacoby *et al*. 1973)

Contemporary researches consider and accent the psychological (mostly attitudinal and emotional) factor of loyalty. For example Oliver (1999) defines loyalty as a deeply held commitment to rebuy or repatronize a preferred product or service in the future, thereby causing repetitive same-brand or same brand-set purchasing, despite situational influences and marketing efforts having the potential to cause switching behaviour. Chaudury (1995) says that loyalty is a consumer's preference to buy a single brand name in a product class and it is a result of the perceived quality of the brand and not its price. According to Dupe, the loyalty is a continued psychological identification and social attachment arising from involvement with a social or political institution, whether a class movement, car brand, sports team, beer, political party, religion etc (Dupe 2000). For Reichheld the customer loyalty is about much more than repeat purchases. It is the willingness of someone (a customer, employee, a friend) to make an investment or personal sacrifice in order to strengthen a relationship. (Reichheld 2003). There are also approaches comparing loyalty with marriage (Hofmeyr *et al.* 2000; Lewitt 1983; Dwyer *et al.* 1987).

In the literature there is very often used term *brand loyalty.* According to Dupe's definiton showed above, it is possible to be loyal to anything. Hence high variety of terms like *store loyalty, service loyalty, political loyalty are used.* In the tourist behaviour research the loyalty is not exactly defined. Most frequently there are two terms used: *destination loyalty* and *repeat visitation*. First pertaining to tourist's attitude toward a destination and second related with tourist's consumption behaviour.

There is a plenty of methods to measure behavioural or attitudinal loyalty. Jacoby and Chestnut described already in year 1978 about 53 methods to measure loyalty, of them 33 to measure behavioural and 11 to measure attitudinal loyalty. All of them are quite complicated and contain numerous and serious problems. (Jacoby *et al.* 1978) Jones and Sasser (1995) have proposed three measures of loyalty:

- **Customer's primary behaviour** – recency, frequency and amount of purchase;
- **Customer's secondary behaviour** – customer referrals, endorsements and spreading the word;
- **Customer's intent to repurchase** – is the customer ready to repurchase in the future.

In tourism literature several authors have adopted similar approach. Oppermann (2000) measured number of revisits, Petrick (2004) measured number of revisits, WOM and intents to revisit, Chen and Gursoy (2001) used tourist's willingness to recommend a destination as an indicator of their loyalty. Valle, Silva, Mendes and Guerreiro (2006) have successfully tested a hypothesis that revisiting intention and

willingness to recommend are adequate measures of destination loyalty intention. Due to the difficulties in measuring affective loyalty behavioural measures are generally utilized more often to measure loyalty (Petrick 2004). As mentioned before, Oppermann (2000) suggests the use of the behavioural characteristics of destination visitation for measuring destination loyalty. In the current study only the first behavioural measure - primary behaviour – is in the focus.

Method and data of the survey

There are many methods and approaches that can be used to locate mobile telephones. Technical solutions vary from handset-based systems with special telephone software to satellite navigation and peer-to-peer positioning tools using Bluetooth. Passive mobile positioning data is concerning the location of call activities or handovers of the mobile telephones in network cells that is automatically stored in the memory of service providers (Ahas *et al.* 2008). This data source offers good potential for the monitoring of the geography and mobility of the population, since mobile phones are widespread, and similar standardized data can be used around the globe. Issues of privacy and surveillance are very important aspects of any mobile positioning data.

Passive mobile positioning data is normally collected to the precision of network cells. Every cell has a certain geographical coverage area and unique identity code, and therefore this method is called Cell ID. The size of a network cell and all cellular networks is not fixed; the phone normally switches to the closest antenna or the one with the strongest radio coverage or best visibility. If the network is crowded or visibility is disturbed, the phones can be switched not to the nearest station but to any other in the neighbourhood.

In the current paper there is used data from the EMT which is the largest Estonian mobile operator. EMT covers nearly 99.9 percent of the total land area of Estonia, which measures 46,000 km2. Geographical preciseness was determined with Cell ID (Figure 1). The method for data collection and analysis has been developed in Estonia in cooperation between private company Positium LBS, mobile operators and the Department of Geography of the University of Tartu.

The database used in the current study includes the locations of all call activities of foreign (roaming telephones) in EMT network: calls in and out, SMS in and out, and any other active use of network. The entries include the following parameters for every call activity:
a) the time of the call activity;
b) the random ID number for the phone (not related to phone or SIM card number);
c) the cell ID with the geographical coordinates of the antenna;
d) nationality – the country of origin of telephone.

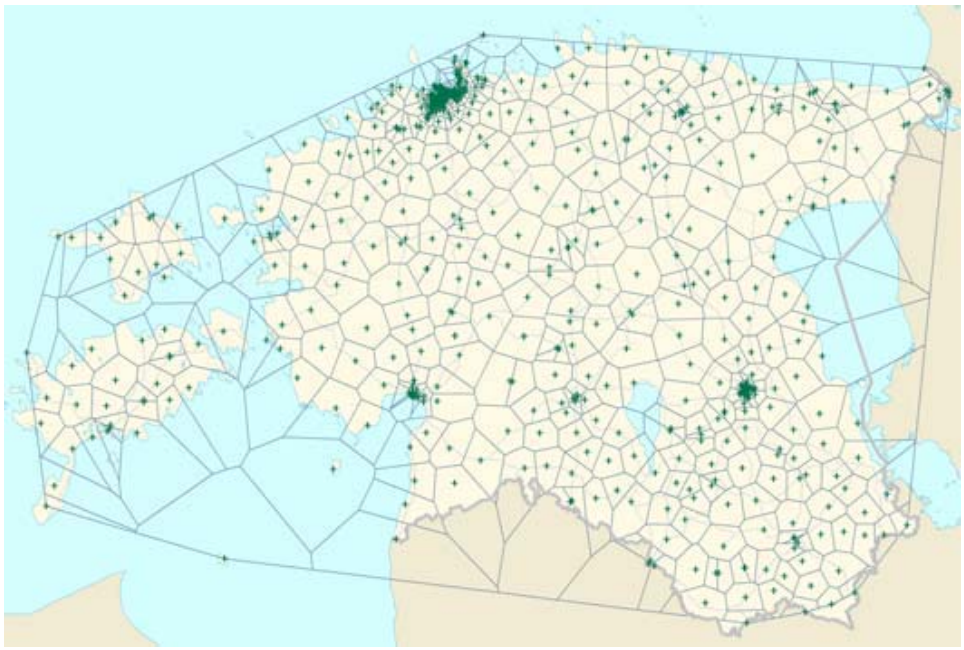

Figure 1. Distribution of networks cells (Cell ID) of EMT Network in Estonia (+ antenna, cells calculated by Voronoi tessellation).

Due to privacy issues, the database does not contain any personal information about the respondents, but only a randomly given ID for every phone. The random ID generated by the operator enables to identify the calls maid by one person during the study period. There are hundreds of locations of calls for every ID, and analysis of this data is in the beginning. An example of the database is: Nationality Latvian; Time September 8. 2007. 22:03:11; ID 64353; Location E27-44-39.00 N59-25-49.00.

The use of mobile positioning data brings up the issue of privacy and surveillance. This is the major concern of general public as well a phone holders, operators, and researchers. Therefore the research team together with the mobile operators and the Estonian Data Protection Inspectorate checked carefully the accordance of data use with Estonian legislation and EU directives (Directive 95/46/EC; Directive 2002/58/EC). Mentioned study and discussions concluded that the personal privacy of respondents is protected. There is no personal information connected with data, and the generalisation level of the analysis does not allow the identification of single persons on geographical or temporal grounds. It is not possible to extract individual movement tracks from the data. Nevertheless, there is concern about issues of privacy and ethics, as any use of mobile positioning data is very sensitive in this respect.

The repeat visitors were identified using database of call activities of roaming phones in Estonia since 25.04.2005 till 31.01.2009. For this purpose was developed model which selected repeat visits on the basis of time interval. The study of frequencies of call activities in Estonia showed that majority (88.8 %) of calls were made with interval of 24 hours (Figure 2). Those calls made within 24 hours were probably made during same (single) visit to Estonia. The rest of 11.2% calls was

distributed over the all study period of 3 years. For determination of repeat visit was selected minimal interval of 7 days without calls in Estonia. Of course, the chosen 7 days is not ideal time unit. There is a need to analyse visiting frequencies of different nationalities and destinations and to make statistical model for selecting best interval for repeat visits.

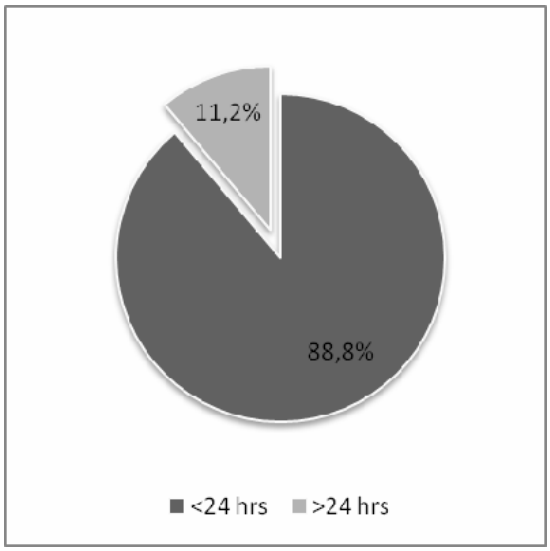

Figure 2. Temporal distribution of repeat calls: >24h and <24h.

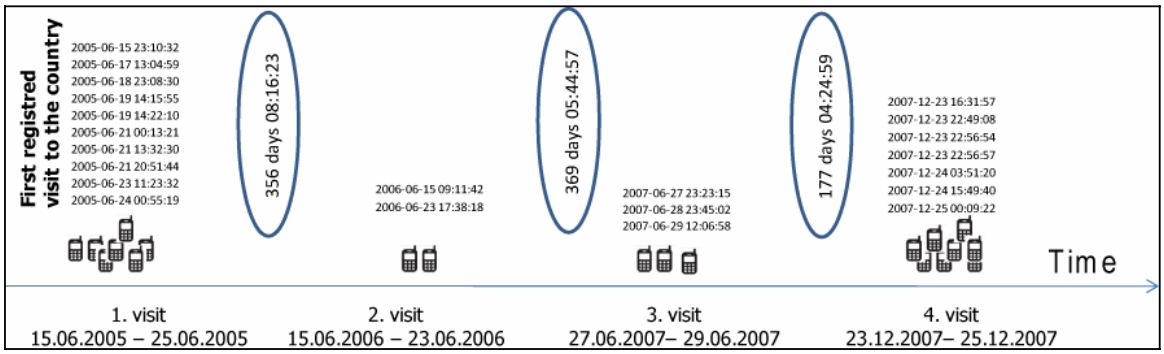

Figure 3. An example of visiting profile (call activities and timing) of one repeat visitor.

This interval of 7 days allowed to identify persons (telephones) which visited Estonia more than 1 times per 3.7 years of study period. The visualisation of model is presented in figure 3 with one randomly selected phone. Using this model were selected repeat visits from database of all visitors for period of 25.04.2005-31.01.2009. The duration of visits was determined as time interval between first and last call made in Estonia during one visit.

Results and discussion

All together there was 2.26 million visitors and among them was 675 000 visitors who visited Estonia more than 1 time during the study period. This makes 29.9% of total number of visitors repeat visitors (Figure 4A).

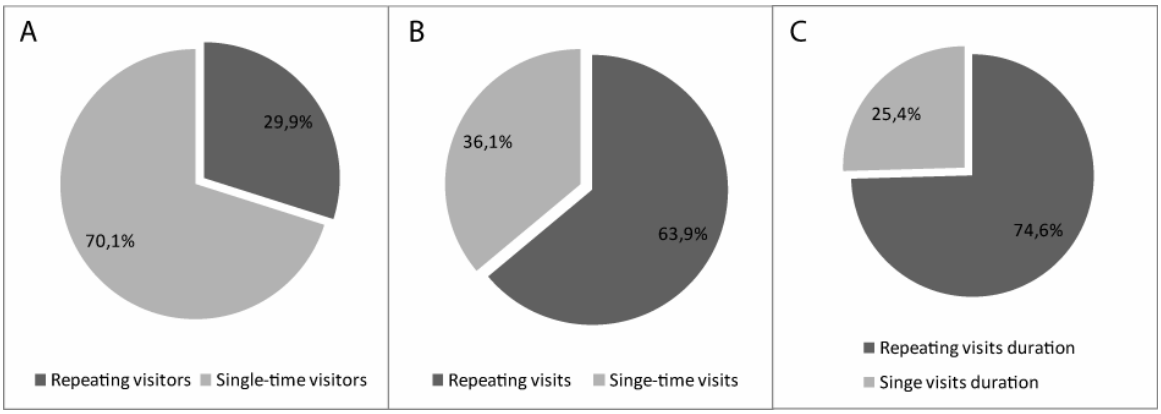

Figure 4. Share of repeating visitors (A); repeating visits (B); duration of repeating visits (C).

The proportion of repeating visits was much higher than number of repeating visitors. 63.9% of total number of visits to Estonia is made by persons visiting Estonia more than 1 times (the number of visits includes also the first visit of repeating person) (Figure 4B). The duration of repeating visits is even longer, 74.6% of visiting time in Estonia was spent by repeating visitors (Figure 4C).

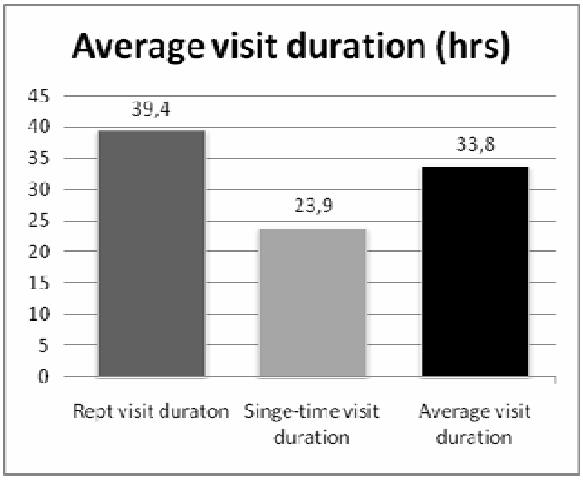

Figure 5. The average duration of visit for repeat visits and single visits.

The length of average repeating visit is longer than single visit. Repeating visitors stay in Estonia 39.4 hours, single time visitors 23.9 hours (Figure 5). The database of repeat visitors consist all together more than 100 nationalities. Different nationalities have different proportions of repeat visitors (Figure 6). This is influenced by geographical location as neighbouring countries are more frequent visitors. This share is also influenced by size of country and number of total visitors. Bigger countries have higher number of possible visitors. Smaller visitor number makes variability higher. There are also special cases Indonesia and Philippines. Many international ship crews are composed from those nationalities and if those ships visit regularly Estonian waters they are presented with high share of repeat visitors.

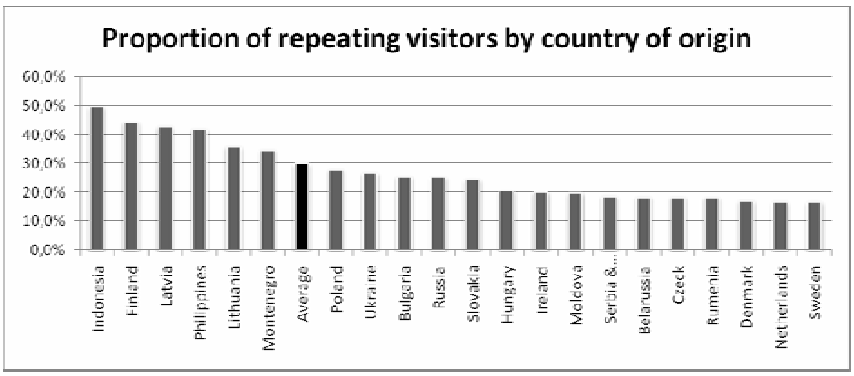

Figure 6. Proportion of repeating visits by country of origin in all databases.

National distribution of repeat visitors is different from share of all visitors (Figure 7). The share of repeat visitors is higher than share of all tourists for closest neighbours. Finns make 53% of all repeat visitors compared for share of 35% from total visitor number. Same number for Latvians is 13.1% and 9.1%; Lithuanians 4.7% and 3.9%. Numbers of visitors is remarkably smaller for other nations and differences in share of repeat visits are not visible in total visitor flow.

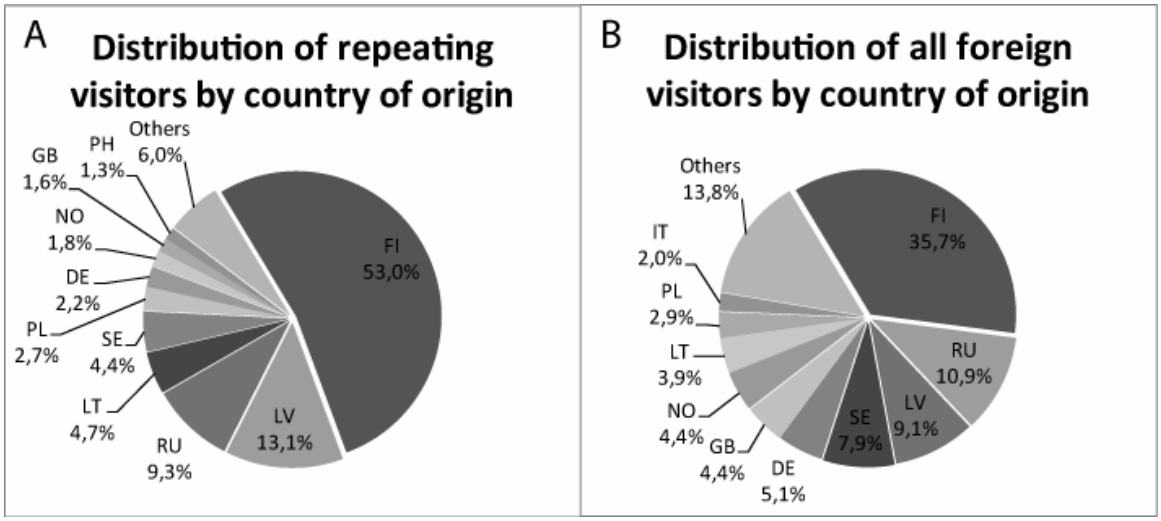

Figure 7. Distribution of all foreign and repeating visitors by country of origin.

The repeat visitors can be also divided into frequent and rare visitors. Rare visitors make 1-2 visits per year or few visits during all study period of April 2005 to January 2009. Frequent visitors can be identified as those who have made more than 5 visits during study period, frequency of their visits is higher and interval 1-10 weeks (Figure 8). The frequent visitors make 22.9% and rare visitors 77.1% of total number of repeat visitors.

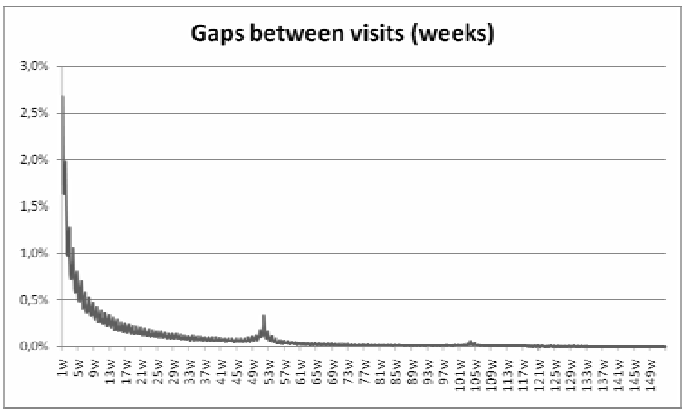

Figure 8. Distribution of regular visits, rare and frequent vistors.

The geographical distribution of repeat visits has special pattern (Figure 9). Tallinn and surrounding Harju county have highest percentage of repeat vists – 25.5. This is probably because Tallinn Harbour and Airport is major gateway for most of tourists visiting Estonia and especially for major visitor group Finns. Võru county has relatively low number of visitors but share of repeat visits is high: 23.7%. This can be because of crossing highway from Latvia to Russia.

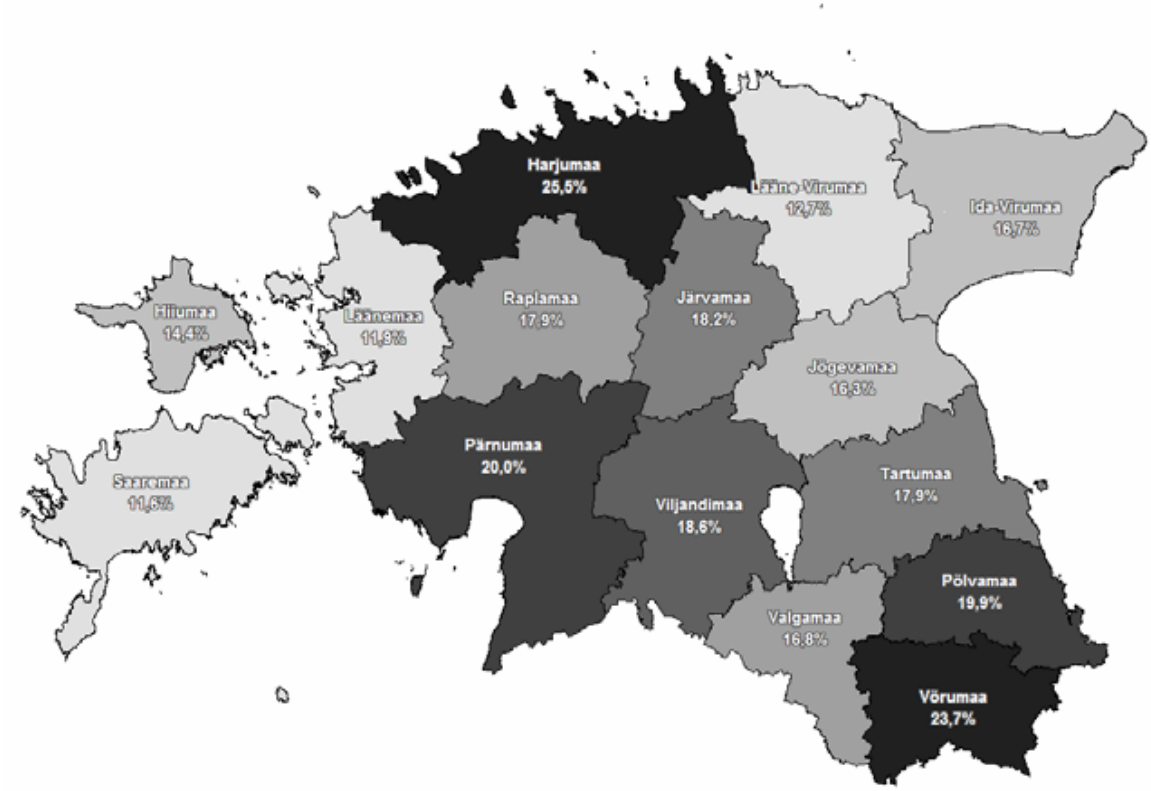

Figure 9. The geographical distribution of repeat visits in Estonian counties (% of repeat visits in total number of visitors).

Second cause can be that this Estonian region is most distant from Tallinn harbour and Airport which is major international Airport in Estonia. Distance is minimising number of irregular visitors and share of repeat visitors is rising. The higher share of repeat visits is also in Pärnu county, which is situated on major highway from Riga

(Varrssavi) to Tallinn (Helsinki, St Petersburg). Pärnu is major spa and beach resort for Estonian and foreign visitors in Estonia. Smallest number of repeat visitors is in Saaremaa (11.6%), Läänemaa (11.9%) and Lääne-Virumaa (12.7%) counties. Reason for such a distribution is not clear as Saaremaa and Läänemaa are also counties with a lot of tourism attractions and high number of visitors. The geographical distribution of repeat visits and visitors need more detail analysis.

Empirical data reveal the importance of the repeat visitors in the Estonian tourism industry. The proportion of repeat visitors was about 30 per cent of all visitors (see fig. 4 A), about 64 per cent of total visitations (see fig. 4 B) and 75 per cent of the total time spent in Estonia by all visitors during the observed time period. It reflects the behavioural difference of repeat visitors from first time visitors. They are visiting Estonia more often and their visit last longer than first time visits. Figure 5 indicates that duration of repeated visits (ca 40 hours) is on an average about 16 hours longer than first time visits. Authors have observed the average duration of repeat visits of several segments (results are not presented in current paper). It turned out that "infrequent" visitors stayed longer than "frequent" visitors. For example tourists visiting Estonia once per month or more seldom used to stay in Estonia on an average around 6 days. It is interesting result, which requires further research.

But already based on the current findings one could argue that there exists a very important reason accrued for governments to manage loyalty of tourists. Addressing the segment of repeat visitors, who prefer to stay longer in Estonia could be increased the tourism revenues. This proposition accords with the statement mentioned above about the long-term customers willingness more likely to expand the relationship with suppliers – in this particular case with the region or country.

Another important distinction is to explore the distribution of the repeat visitors by their countries of origin. As mentioned above Oppermann (2000) has stated that repeat visitors very likely have positive attitude towards the destination. According to Kuusik and Varblane (2009) there are multiple ways to segment customers by loyalty. These segments have different reasons to behave loyally and therefore in order to address their needs different strategies should be implemented. As seen on the figure 6 the proportion of repeat visitors is highest by Indonesians and quite high by Filipinos. It is very likely that repeat visitations of this segment are not associated with positive attitude – they are forced to be loyal and come back to the destination only because they are sailors. Thus, quite big portion of repeat visitations are probably made by sailors or long-distance drivers. In the future it is needed to develop the PMP method to better distinguish tourists from sailors and long-distance drivers. For example it should be possible to handle separately repeat visitors who visit old towns, beaches, events or sightseeing areas. On the other hand it is not reasonable to exclude sailors and long-distance drivers (repeat visitors who use mobile phones only on the harbour areas or near the highways) from further investigation. Because they form a quite big segment - solely Filipinos there are about 1.3 per cent among repeat visitors (see fig. 7 A). From the tourism policy prospective is necessary to explore how much and how often they use

accommodation, catering and other services offered in regions where they stay or drive through. This issue needs special discussion.

As seen on the figure 8 it is possible to segment repeat visitors by frequency of the visits. There are frequent visitors who visit Estonia every week or every month. And there are infrequent visitors who visit Estonia once in a year or in two years. Definitely they are distinct segments having distinct motives and attitudes and therefore it requires distinct strategies to approach to them. For example some of the frequent visitors could be foreign workers or business people. It is another avenue for the future research - surveys are needed to explore more precisely who belong to these segments and which is their calling behaviour. The problem is also, how to filter out the Estonians working abroad. It is highly probable that many of the repeat visitors are not traditional tourists but related to Estonia by work or family ties. They are not in Estonia permanently but with long intervals and they use in Estonia mobile telephone, which is registered in foreign country. In the current paper they were treated as repeat visitors. On the one hand they are like other foreign residents and through their spending in Estonia they also generate tourism receipts for Estonia. From this aspect they are as valuable for Estonia as "traditional tourists". On the other hand it is not right to treat them as loyal foreign tourists and assign their behavioural specificity to the traditionally defined tourists.

Policy implications of the use of PMP method

The major strategic document regulating Estonian tourism policy is National strategic plan of tourism development of Estonia 2007-2013 ratified by Estonian government in 2006. The aim of the plan is to present the balanced strategy for increasing the international competitive ability of the Estonian tourism sector and therefore support the Estonian economic growth. The strategic aims of Estonian tourism policy address the importance to deal with (National … 2006):

- Increasing the reputation of Estonia as tourism destination;
- Advancement of tourism product development (increase of knowledge and quality, several innovative products and activities, development of cooperation networks);
- Development of the information system of tourism.
- The execution and development of tourism policy is delegated to the Estonian Tourist Board of the foundation "Enterprise Estonia". (National … 2006) Enterprise Estonia is managed by 13-member supervisory board and 5-member management board consisting of the top entrepreneurs and officials and the members of the parliament. Enterprise Estonia has developed more detailed action program to achieve the first aim mentioned above. There are some major statements of the action program listed as follows (Promoting Estonia …):
- In constant increase of the share of the independently organised trips the final consumer of the potential tourist is in the main focus.
- The aim is to extend the visit to Estonia, favour the first visits from the farther markets and repeated visits from the close markets and the visits beyond the

high season, also to expand the client base for the different age groups and more demanding and solvent client group.

- The campaigns, advertising introducing the attractive tourism products are directed to the publicity of target markets and the media relations are organised to perceive the reputation of Estonia as the appropriate tourism destination at the important target markets.
- The citizens of EU member states, especially close markets, incl the tourists of Finland, Sweden, Norway, Russia, Germany, Great Britain, Latvia, Spain are of high potential and priority for Estonia as the tourism destination.

It is clearly seen that the main focus of mentioned policies lies on the big campaigns which are directed to the big target markets. And even if there was stated that repeated visits from the close markets are wanted, there are no sufficient indicators for measuring that. In practice, it is possible to measure only export turnover of the tourism services and number of overnights made by tourists. The results of the empirical use of PMP method presented above clearly indicate high potential of its use in order to improve the quality of data about tourism flows in Estonia. Particularly relevant feature of the PMP method is that it allows to get information about the duration of the stay of visitors in Estonia. It creates potential for the Estonian tourism strategy to address completely new and very important segment – repeat visitors from the various aspects. It is possible to observe and measure the duration, density, seasonality and dynamics of repeat visitations. In addition the local destinations and events most loved by repeat visitors and the trajectory they are using could be also identified. Even if the aim of the Estonian tourism policy is to extend repeat visits there was impossible to measure the outcome of the policy and therefore was impossible to set clear tactical goals. PMP method could be a tool for the Enterprise Estonia to get valuable information and therefore implement more specific tactics to extend repeat visits.

Also the method allows to segment repeat visitors for example by countries of origin or frequency of visitation and therefore to deduce various conclusions about repeat visitors. For example Estonian tourism policy needs to answer questions, how to deal with such visitors as sailors and long-distance car drivers, as they still have potential to be loyal clients to Estonian service providers (shopping centres, taxis serving harbours, mobile operators serving their phones etc.). Estonia tourism strategy currently completely fails to address those issues. Adequately developed policy instruments targeting this segment may turn these visits more productive for Estonia increasing their spending. Also it is possible to use such visitors as promotional tool spreading the word in their native countries.

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