HETEROGENEOUS MARKET RESEARCH INFORMATION IN TOURISM

- IMPLEMENTING META-ANALYTICAL HARMONIZATION PROCEDURES IN A CITY TOURISM VISITOR SURVEY DATABASE

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ABSTRACT

In the field of tourism various market research data from guest surveys is available. However, this valuable information can not be compared as each entity uses different survey designs and therefore obtains heterogeneous data. Hence, extensive data is available but wise use of this data is impossible unless the information is harmonized in a comprehensive database. In this paper a comparable database is suggested that serves as a marketing information system and offers new opportunities for analyzing data from different sources. It discusses various comparability problems derived from seven European visitor surveys and shows how to harmonize heterogeneous data. Final result is the proposal of a quantitative model which integrates guest survey data from several European cities and allows access to a comprehensive database via the Internet.

1. INTRODUCTION

1.1 What is comparability?

Comparability may defy precise definition, but it is an important and useful concept. By this we mean that data (estimates) for different entities can be legitimately (i.e. in a statistically valid way) aggregated, compared and interpreted in relation to each other. Comparability is a relative concept, as the best case scenario of absolute comparability is not attainable (Verma 2002a).

Data standardization is a useful tool for ensuring that conditions for comparability are actually met. A more general concept is termed harmonization, which is taken “to encompass consistency, similarity, standardisation, etc., depending on the context” (Verma 2002b: 192). In this paper, the concepts of standardization and harmonization are used as synonyms.

The creation of highly standardized micro-data sets is an important output of this paper. This is a crucial element of data comparability.

1.2 Comparability in international tourism

Tourism marketing is becoming increasingly sophisticated as a result of greater importance attached to the reliability of information and the competent analysis of that information for the effective planning, monitoring and management of tourism entities (Bar-On 1989). In the field of city tourism, market research plays an important role in order to understand and actually satisfy the visitor’s needs. However, there are severe problems when someone wants to compare the results of these market research initiatives. Clearly, there is a need for a comparable international tourism database which contains data from different sources and harmonizes it in order to facilitate comparative analysis with competitors. By means of a harmonized data pool each user could enhance his learning opportunities and implement more sophisticated marketing strategies.

Many entities carry out guest surveys to analyze data and adapt their marketing strategy, but as each entity Laneds its own research project, methods and design differ from case to case. Hence, there are a number of different guest surveys which all pursue the same objectives but try to reach them by using different strategies. In general there is little consistency between the different sample surveys in terms of survey techniques, definitions and presentation of analyses, so that comparability is greatly impaired (Devas 1991). A comparable international tourism database requires identical survey designs and methods (Wöber 1997). There is even a need to standardize the meaning of many of the basic
terms employed in describing tourism. International compilations of (city) tourism are rare and constantly lack comparability of the collected sources (Van den Berg 1995). To arrive at similar methodologies for all participants is a long-term objective which cannot be enforced by a single initiative.

The first attempts to introduce a recognized uniform international system for tourism statistics were made by the World Tourism Organization (WTO). It published several manuals and reports “for providing guidance to national and local governmental statistical offices and the private industry in the implementation of WTO/UN Recommendations on Tourism Statistics” (World Tourism Organization 1995: i). Another initiative presenting recommendations on tourism statistics by Eurostat considers certain fields of tourism markets but does not particularly mention city tourism (Eurostat 1996).

As a first step towards this long-term goal of comparable city tourism data European Cities Tourism (ECT) elaborated a proposal for a questionnaire design for guest surveys in European cities (FECTO 1999). This common “blue-print” questionnaire serves as the point of departure for all national surveys. The questionnaire puts together a common set of questions which city tourism managers are recommended to use as the basis for tourism visitor surveys they may undertake in their respective cities in order to achieve the level of consistency necessary for comparative analysis. The variables and values of this survey are the basis and reference for all other variables and values originating from surveys carried out by Eurocities (i.e. ECT member cities). The proposal’s task can be seen as a certain stage of pre-harmonization, while this paper tries to post-harmonize both structural and content relations between the surveys.

Although the proposal with its set of core questions helps to improve the comparability and integration of statistics, each city adds or leaves out specific questions or changes some details concerning variables or values of the data set as it wants to adapt the questionnaire to its own needs. The problem is based on the fact that tourism is characterized by numerous features which are typical for individual countries and cities only (FECTO 1998). The ECT proposal is only a guideline and open to any changes so that each particular city can add or leave out some specific questions or modify some variables depending on its own objectives. So the issue of comparability still remains a problem to be solved. This leads to three main research questions to be dealt with in this paper:

1. Which types of data heterogeneity in guest surveys do exist?
2. How can heterogeneous data be compared and combined (showing an example of a method used for the purpose of comparison)?
3. How can these findings be used to generate a general model that can be applied to overcome some of the limitations associated with heterogeneity in (city) tourism guest surveys?

The objective of this paper is to outline the database model and to introduce a decision support system offering access to a large number of information describing and analyzing visitor behavior in the field of international tourism.

The present article is structured in five sections: The first section provides an overview of the central questions commonly asked by guest surveys. The second section deals with the nature of heterogeneity in guest surveys and includes a listing of different reasons for heterogeneity in order to consequently point out some methods that can be used to harmonize data from different sources and how these procedures can be applied in a harmonization model (illustrated with a case example). Finally, the last section describes how these procedures are evaluated in order to measure the overall success of the system.
2. CENTRAL QUESTIONS COMMONLY ASKED BY GUEST SURVEYS

Since 1999, when ECT introduced the Eurocity survey only a few cities have been able to participate in this project. Up to now, surveys in seven European cities (Amsterdam, Berlin, Dublin, Edinburgh, Heidelberg, Tallinn and Vienna) were carried out and are examined in this paper. Each single survey was administered face-to-face by interviewers. In total 20,296 interviews are available where one interview consists of 180 variables on average. This number is going to rise as data from other international cities will join the database in the near future.

The study of the present questionnaires has shown that there exists a set of core questions that forms the basis of almost every guest survey. The main focus of data harmonization is on this set of questions as they provide the decision maker with the most important information needed.

Central questions that can be found in almost every guest survey concern type of accommodation, forms of transport (either to travel to the destination or to get around the city), way of booking the journey, types of information used to support the decision where to go, activities done during the stay, satisfaction with the visit and expenditure on different categories (e.g. accommodation, meals etc.). Hence, from a wide point of view, the questions are quite the same in terms of their content. The problem is that the characteristics of the questions (kind of survey, used wording, proposed answers in item lists) are different. That’s why at first glance identical questions finally have different variables and values: The question is the same because it deals with the same topic, but this question can be applied and understood in different ways, depending on the objectives of the guest surveys. This results in differences between guest surveys that can be separated into three main categories: technical, conceptual and semantic differences (Kotabe 2001).

3. NATURE OF HETEROGENEITY IN GUEST SURVEYS

The reasons for heterogeneous data can be divided into three categories while the boundaries between these concepts are blurred and open to discussion. The different aspects of heterogeneity are listed on a hierarchical basis and start with the technical aspect (i.e. non-textual differences) of heterogeneous data. Then conceptual and semantic aspects are explained. Together they are called textual differences as they result from discrepancies due to the content of the question.

3.1 Non-textual differences: Technical aspects of heterogeneous data

Technical problems that can occur in comparing guest surveys are all deviations that are not tied to the content of the survey’s questions, e.g. linguistic idiosyncrasies, type of survey (interview vs. questionnaire), sampling techniques and sample sizes, the order of questions (the order of proposed answers influences to a certain extent the interviewee’s response) or form of questions (e.g. open/closed form, single/multiple responses). These differences are of technical origin as they are caused by the characteristics of data collection as a “tool” for research issues.

Different survey techniques may result in heterogeneous data. In terms of data harmonization it is definitely not irrelevant if information is gathered by using oral interviews or filling in questionnaires (self-administered or administered face-to-face by interviewers). The same counts for open-ended respectively closed questions, as will be shown further on.

An open interview leaves much scope for different answers and interpretation. This leads to the problem that data and its standardization is much more difficult to be controlled and harmonized. Concerning the mode of data collection, each city’s survey was administered face-to-face by interviewers. Therefore, this source of possible variance between cities can be neglected.
Different sampling techniques and sample sizes may lead to comparability problems. Comparability of estimates can be achieved only if the net samples are not seriously biased. If the sample of one survey is more representative than the other one, the basis of harmonization and consequently the standardized data may be biased. To ensure representativeness by using random samples it is necessary for interviewers to adhere to strict rules. After the guest surveys using different sampling techniques have been carried out there is little scope for data harmonization to correct the bias.

The concept of workable and equivalent sampling strategies in all participating entities stands for random (probability) samples (Häder et al. 2002). The analyzed surveys in this case used random samples, therefore the comparability of unbiased or at least minimum biased estimates is granted. Kish supports this conclusion as he states that “sample designs may be chosen flexibly and there is no need for similarity of sample designs. Flexibility of choice is particularly advisable for multinational comparisons, because the sampling resources differ greatly between countries.” (Kish 1994: 173). Following this, an optimal sampling design for cross-cultural surveys should consist of the best (random) practice used in each participating country resp. city. Hence, the basic requirement to use random (probability) samples leads theoretically to comparable data. However, in the end the degree of harmonization also depends on other influences – such as question wording, translation problems and so on.

Linguistic idiosyncrasies are among the most common barriers to optimal comparability between fieldwork in different countries. Up to now many cross-national surveys have employed an arbitrary approach to translation, which is a very important and often underestimated component of quality and equivalence in cross-national studies (O’Shea et al. 2001). The proposal’s design is sequential, that is, a source questionnaire was developed and finalized before translation began. This approach should reduce translation errors and improve comparability from a linguistic point of view. The issue here is to rather develop than translate the questionnaire (Harkness 2002).

When comparing heterogeneous data one should also bear in mind the order of the surveys’ questions and the arrangement of the answers proposed. Questions do not appear in isolated form in surveys, but are always part of a sequence of questions, namely a questionnaire. The problem is whether answers to a given item are influenced by the particular questions that precede it. We will refer to this problem as that of question order. Quite the same problem at another level occurs within any closed item: The order of alternatives offered to a respondent (the response-order problem). In principle, due to a systematic tendency for respondents to choose the first or last alternative in the set, terms at the beginning of an item list attract unlikely more attention than those placed in the middle (Schuman and Presser 1996). In terms of the spacing of questionnaire items respondents may lose track of more distant items, reducing the likelihood of their use. As a result, the impact of a context item at the question comprehension stage is likely to decrease as the number of intervening items increases (Sudman et al. 1996). When respondents are asked to rate a series of items on numerical scales, they often face the problem of establishing an initial reference point. The lack of evaluative reference points may result in the assignment of extreme values initially, which are then moderated for the following items in the list (Carpenter and Blackwood 1979). This raises the question if a certain method can accommodate the fact that in different surveys the same question offers answers in a different order. The main issue is to assess to which extent such a case of different arrangement leads to distortion of data. According to Schuman and Presser, order effects occur most clearly “where (a) there is an intrinsic logical order to a set of items that is facilitated or disrupted by the order in which the items are asked, and (b) lengthy response scales are used that can detect small effects.” (Schuman and Presser 1996: 54). Therefore, harmonization issues will concentrate on these characteristics of guest surveys’ question and response order.

Different question forms also can complicate the harmonization process. In general the approaches of open-ended or pre-coded questions can be adopted. In an open-ended question the interviewer asks a
question without any prompting of the range of answers to be expected while a pre-coded or closed question provides a set of fixed alternatives from which respondents can choose.

On the one hand, open-ended questions do not limit respondents to alternatives within the investigator’s frame of reference, and it also avoids suggesting or imposing answers the respondent may not have considered. On the other hand, the open form has two major disadvantages: First, analysis of verbatim answers is laborious, and second, at least in the case of self-completed questionnaires, response rates can be very low since people are often too busy to write out free-form answers (Veal 1992). In contrast to an open question, the closed form restricts responses to those relevant to the researcher’s aims and provides data in a form that is easier to code and analyze. For instance, the question concerning “means of transportation” uses an closed item list of about eight values that covers all existing forms of transport ranging from plane to walking. The question of “activities done” is much more complex as activities tourists have engaged in in their holidays are an open and dynamic field. It is hardly feasible to cover all possible activities in a closed item list using eight values like e.g. the variable “means of transportation” does (as it is more static). An open-ended format question could simply ask respondents to list all the activities they have engaged in. Without any prompting of the range of activities respondents might have difficulty in recalling all their activities. In addition, guest surveys interviewing 1,000 or more people might come up with a total of 40 or 50 activities which makes harmonization of data very difficult.

Another level where problems can occur when comparing guest surveys is the application of different scales in pre-coded questions. For instance, in the case of age, either an ordinal or ratio measurement can be used. The ratio scale records the exact age while the ordinal one offers age groups to the respondent. The advantage of the former is that recording the actual number rather than a code for a group leaves the option of grouping categories in a variety of ways when carrying out the analysis. The ordinal scale has the advantage of convenience and saving any embarrassment the interviewee may have about divulging his precise age. When two or more survey designs use either the one or the other approach, an opportunity to harmonize data is to group responses to the ratio scale into categories which the ordinal measurement applied in its surveys. When harmonizing heterogeneous data the researcher should account for the problem of differently scaled item lists as they require diverse standardization procedures.

Another technical aspect of heterogeneous data is the problem field of multiple response questions, i.e. more than one response is allowed to answer the question. Whether a guest survey uses this kind of question or not has much influence on the information content of the respective variable. It makes a big difference if only the most important answer to a question is expressed by the guest or if the questionnaire asks the interviewee to list all relevant items. Different objectives of involved researchers determine whether the first or the second option is chosen. There is no doubt that harmonization problems occur when two or more different guest surveys use either one or both techniques, but not consistently with the same question. This problem cannot be solved on an individual level, however, on an aggregated (group) level it is possible to estimate the most important variables by calculating relative frequencies of individual items. The issue of multiple response questions may also touch the aspect of conceptual differences between guest surveys as this characteristic can be used as a tool to stress the importance of the particular question’s content.

3.2 Textual differences: Conceptual aspects of heterogeneous data

Conceptual aspects are due to discrepancies in terms of the content of the question as they refer to the overlap in the definition of a given concept across the different surveys (Kotabe 2001). They mainly result from different questions or variables respectively values used in guest surveys. A very important conceptual aspect of heterogeneity that occurs quite often is the case of additional and/or missing variables or values. For instance, the question “which of the following activities have you done on this visit” offers possible answers in one guest survey that may not be covered by another one and
vice versa. The same problem occurs if one question can be answered either with “yes” or “no” (nominal scale) while the same question in a different questionnaire is answered on a rating scale from 1 to 6. This problem of different scales shows that the boundaries between different aspects of data heterogeneity are floating as this scales issue might also be categorized as being a technical problem.

Conceptual differences also appear when questions do not intend to ask exactly the same. Hence, the interviewee understands the question in a different way and therefore gives different answers, depending on the particular question. This should be anticipated by trying to find out the aim and intention of the question used in the guest survey. Of course it is arguable to which extent this aspect should be taken into consideration as due to the subjective interpretation of each respondent even identical questions can be understood in a completely different way. As answering a question involves several stages and the question wording and the nature of the response alternatives may affect the respondent’s judgement, information processing remains an individual cognitive process that is difficult to be formulated in an explicit model (Schwarz and Sudman 1996). Therefore one will never exactly know how a question was understood in a particular situation.

3.3 Textual differences: Semantic aspects of heterogeneous data

In contrast to conceptual differences the semantic aspect is more a subtle one. The differences concern the wording of the question, i.e. the meaning of a basically identical object (e.g. the problem if the activity “visiting sights” corresponds to “seeing classic sights” or not). The same words can have different meanings in different sources, or different words can have the same meaning. Incompatible uses of the same word can be resolved by separating the words into different contexts and defining the mappings between words in different contexts (Tawakol and Singh 1995).

While the conceptual aspect represents textual differences in its literal meaning, semantic differences are strictly spoken no textual difference (in terms of content of the object). From a hierarchical point of view they are situated one level above the conceptual aspect. Semantic differences originate from the fact that the concept is the same but different wording (e.g. more comprehensive terms or synonyms, different naming conventions or precision levels) is used (Kim et al. 1993). So the difference is more detailed than in the case of conceptual aspects. Clearly, there are alterations in question wording that are ambiguous with regard to whether the substantive question is altered in character or only in some secondary feature. Hence, the boundaries between these two aspects of textual differences are floating as e.g. a more comprehensive term (semantic aspect) can also be categorized as an additional value of a variable (conceptual aspect). At some points there is a gray area where changes in the wording of a question tend to become changes in the issue itself. It depends on the interpretation of the researcher if, for instance, the term “plane” equates with “charter flight” and/or “scheduled flight” or not. Therefore these two subgroups of semantic and conceptual aspects compose the item of textual differences (in a wider sense) as collective term.

The next paragraphs point out some methodological possibilities to overcome the heterogeneity problem. The main issue is to find out which method fits best to solve a particular harmonization problem.

4. HARMONIZATION MODEL

4.1 Examples of methodological possibilities to overcome some of the heterogeneity problems

As a famous comparative researcher once put it over 30 years ago, “it is easier to explicate (the problems) than to suggest ways of dealing with them” (Verba 1969: 54). So the question is whether sufficiently comparable data can in fact be compiled in an international database. First of all it should be
pointed out that data from guest surveys are harmonized at an aggregated (meta)level as the problem of missing data at the disaggregated level (i.e. within a particular item of the data set) is not target-oriented as this paper’s objective is to harmonize data from different guest surveys and not to solve the missing data problem of one city’s data. Furthermore, the problem of missing data has been dealt with extensively in the literature (Allison 2001; Rubin 1976). Thus, the analysis takes place at an aggregated and higher level. According to the different aspects of data heterogeneity in each particular question of the surveys under comparison, different meta-analytical harmonization procedures are used. Therefore it is called a “meta-analytical” approach. Main emphasis of the model is on the development of a system for supporting the production of harmonized aggregates from different data sources. General guidelines for the construction of the model are the following principles:

- The system should be able to cope with different types of data sources
- Production of statistical aggregates should be formalized as far as possible
- For aggregate production the model should be able to use data which are not necessarily stored in one homogeneous database but come from heterogeneous sources
- The final model has to be implemented in the Tourism Marketing Information System TourMIS

According to Froeschl et al. (1999), two different levels of harmonization can be distinguished:

- Harmonization at the survey stage, where one tries to develop standardized surveys and sets up a general technological framework (pre-harmonization), or
- harmonization at the analysis stage, where different data sources are combined after the collection of data (post-harmonization).

The actual approach to harmonization of heterogeneous data lies in between these two extremes. First, to look at what data sets are available, then to categorize the differences for each question of the surveys and, finally, to harmonize the variables and values which are of interest.

The central idea of the harmonization model (Figure 1) is to use only standardized terminology inside the system and to translate actual data sets into this “language”. In this case example, ECT’s questionnaire is the language of standardized data (reference frame), its variables and values are the defined terms (conceptual variables resp. conceptual values) and the harmonization procedures are the dictionary to be used. So the main issue is to decide on corresponding variables and to compare their particular values. The connection between the conceptual variables in the reference frame and the actual observed source variables of the different data sets (source frame) is achieved by diverse harmonization procedures (data source mappings). These procedures may be different, but their target is the same: To translate actual values from different sources into the unifying language of the reference frame. This can be done by rules that define the semantic relationships between different concepts (Singh, 1998). Note that, although some information might be lost, the harmonization process allows inspection of the loss of information due to standardization.

Generally, due to the different complexity of the harmonization problem, semantic discrepancies between datasets are easier to be harmonized than conceptual or technical aspects. Irrespective of the type of difference, in each specific stage of data harmonization the procedure that loses the fewest information in comparison with the original data is used. To provide for the best solution, a decision tree is implemented in a database model in order to make heterogeneous data comparable by choosing the most convenient harmonization procedure.

One methodological possibility to overcome the heterogeneity problem is the use of estimation methodologies. Additionally, missing time series (variables) can be calculated by using forecasting proce-
dures or by applying general calculation rules. In the case of missing variables and/or values, substitution by average figures (estimates based on surrogate values or pattern-mixture models) might also be appropriate (Wöber 1994). One should not make the mistake of categorizing similar but not completely identical questions as being not comparable by definition as this approach may lead to a loss of valuable information. It rather should be considered to modify the questions in a way so that they can be treated as being identical respectively to harmonize data by using reasonable methods of data imputation. For instance, maximum likelihood and multiple imputation offer substantial improvements over listwise deletion (Allison 2001).

Different variables from different surveys pose different harmonization problems, hence different harmonization procedures must be applied. In case of missing values the most simple solution is to simply exclude that variable from the analysis. Still, this solution has a major disadvantage: In many cases, listwise deletion can exclude a large fraction of the original sample. This is not a satisfactory solution when someone wants to do a comparison of two or more surveys. Alternative methods that allow to retain some of the embedded information are needed.

There is one main research question that can be split in many sub-hypotheses resulting from comparability problems between special variables and/or values: How can heterogeneous data from Eurocities be modified according to the Eurocity standard without losing more information than it is gained out from the inter-city comparisons? Figure 2 shows the very general concept of the harmonization process. Existing data from guest surveys is compared with the reference frame (ECT’s proposal) and then split in one of three groups: There are either additional or missing variables that can not be compared with the core variables and therefore are not harmonized, or there are slightly different variables that vary on one or more of the aspects presented before. Only the last case poses problems in terms of standardizing data from different guest surveys; These differences may be due to missing values, additional values or semantic differences (Behling and Law 2000). Heterogeneous data is harmonized and finally comparable with ECT’s core variables. Finally, data following the European Cities Tourism standardization proposal is not affected by the harmonization procedures.

Fig. 1. Overall architecture of harmonization model
4.2 The Eurocity database in TourMIS

European Cities Tourism has established a City Marketing Information System (CityMIS) which contains data from participating cities and which is updated continuously. The system is part of the Tourism Marketing Information System TourMIS (http://tourmis.wu-wien.ac.at/ [March 15, 2003]) which is developed and maintained by the Institute for Tourism at VUEBA and the Austrian National Tourist Office. The system allows the rapid retrieval of data, offers procedures for basic statistical operations and the comfortable production of tables and graphs (Wöber 1998). The presented harmonization model is implemented in TourMIS. The nature of heterogeneity that occurs when comparing city tourism guest surveys is disassembled in its generic components and categorized by applying the technical solutions to overcome these problems of heterogeneous data. Of course, the developed model has not only been designed for the special issue of city tourism. It can also be used in an even more international context and is not restricted to the field of tourism.

The Eurocity database serves as a decision-support system offering access to a large number of information describing and analyzing visitor behaviors in European cities. Data from guest and travel surveys are stored in the original disaggregated format allowing full flexibility to the users’ queries. Tourism managers can retrieve data for one individual city, compare two or more cities or analyze the pooled data set.

5. CASE EXAMPLE

As an example for a possible harmonization procedure the question concerning means of transportation used by the visitor was selected here. For this question the Eurocity survey proposes “On your journey TO Eurocity, what was your main form(s) of transport?” (TECTO 1999: 46) and suggests items listed in the right column of Table 1. This multiple response question is compared with the same question from Vienna’s guest survey. In Vienna, 8,869 interviews were held in 1999 while the city was not following the proposal. As Table 1 shows, Vienna’s values are quite different from the proposal as some forms of transport are named differently (semantic aspect) while others are additional respectively missing variables (conceptual aspect). In addition, contrary to the proposal, Vienna’s variable of form of transport allows only one response (technical aspect) as it asks the visitor to choose only “the most important form of transport on the journey to Vienna”. Thus, there are two problems (different items and the lack of a multiple response question) which lead to two stages in the process of harmonization, namely harmonization of textual and non-textual differences.
Table 1. Means of transportation used (different candidate values for a scale)

<table>
<thead>
<tr>
<th>Source</th>
<th>Vienna guest survey</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private car/van</td>
<td>Private car/van</td>
<td>Private car/van</td>
</tr>
<tr>
<td>Hired car/van</td>
<td>Hired car/van</td>
<td>Hired car/van</td>
</tr>
<tr>
<td>Train</td>
<td>Train</td>
<td>Train</td>
</tr>
<tr>
<td>Plane</td>
<td>Plane</td>
<td>Plane</td>
</tr>
<tr>
<td>Charter flight</td>
<td>Boat/ferry</td>
<td>Boat/ferry</td>
</tr>
<tr>
<td>Bicycle</td>
<td>Bicycle</td>
<td>Bicycle</td>
</tr>
<tr>
<td>Motorbike</td>
<td>Motorbike</td>
<td>Motorbike</td>
</tr>
<tr>
<td>Bus</td>
<td>Public bus/coach</td>
<td>Public bus/coach</td>
</tr>
<tr>
<td>Caravan</td>
<td>Private bus/coach</td>
<td>Private bus/coach</td>
</tr>
<tr>
<td>Other</td>
<td>Other (specify)</td>
<td>Other (specify)</td>
</tr>
</tbody>
</table>

First the problem of semantic adaptation has to be solved (Table 2). The term “charter flight” can be seen as a synonym for airplane, as this latter expression can be found in the reference frame. “Caravan” is not included in the proposal, therefore it is added to the most similar term, in this case “private car/van”. The missing values “boat/ferry”, “public bus/coach”, “private bus/coach” and “walked/hitch-hiked” are added so that eventually Vienna’s variable corresponds to the reference frame from a semantic point of view.

Table 2. Example for scale formation

<table>
<thead>
<tr>
<th>Vienna’s original data</th>
<th>Semantically adapted data</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private car/van</td>
<td>Private car/van</td>
<td>Private car/van</td>
</tr>
<tr>
<td>Hired car/van</td>
<td>Hired car/van</td>
<td>Hired car/van</td>
</tr>
<tr>
<td>Train</td>
<td>Train</td>
<td>Train</td>
</tr>
<tr>
<td>Plane</td>
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<td>Bicycle</td>
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</tr>
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<td>Motorbike</td>
<td>Motorbike</td>
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<tr>
<td>Bus</td>
<td>Public bus/coach</td>
<td>Public bus/coach</td>
</tr>
<tr>
<td>Bus</td>
<td>Private bus/coach</td>
<td>Private bus/coach</td>
</tr>
<tr>
<td>Caravan</td>
<td>Private car/van</td>
<td>Private car/van</td>
</tr>
<tr>
<td>Other</td>
<td>Other</td>
<td>Other (specify)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Walked/hitch-hiked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other</td>
<td>Other (specify)</td>
</tr>
</tbody>
</table>

After this step, the structure of the data is the same, but the harmonized numbers are still missing. Therefore, the next issue is to generate and calculate modified and/or missing values (Table 3). Gen-
eral calculation rules (equation 1) are applied for values with the same concept but different notions, e.g. the items “plane” (ECT) and “plane” and “charter flight” (Vienna).

The two separate values of Vienna’s survey simply are summarized to ECT’s more general value “plane”:

\[ 34.1\% + 1.8\% = 35.9\% \]  

(1)

This is a convenient strategy, especially when one value is actually very small (“charter flight” with 1.8%). The same approach is used for Vienna’s “caravan”, which is added to the more general concept of “private car/van”.

In order to complete the other missing values, a harmonization procedure quite similar to pattern recognition is designed. Hence, the issue is to create a model that adapts Vienna’s answers to the proposal, i.e. to modify missing and additional values of the variable “means of transportation”. In this case a pattern-mixture model with Heidelberg (Table 4) as reference city is used. Heidelberg was identified as being the best available reference city for Vienna since this city allows multiple responses for the question under evaluation (Heidelberg’s guest survey follows ECT’s proposal in this particular item of the questionnaire) and has similar topographical characteristics as Vienna. Missing values (“boat/ferry” and “walked/hitch-hiked”) are taken directly from Heidelberg’s pattern. In this case the factor for multiple response is already included. Vienna’s value “bus” is split in “public bus/coach” and “private bus/coach” using the pattern’s code of 42.3% respectively 57.7%.

\[
\begin{align*}
\text{Public bus} &= 4.1\%; \quad \text{key} = 4.1 / 9.7 = 0.423 \\
\text{Private bus} &= 5.6\%; \quad \text{key} = 5.6 / 9.7 = 0.577 \\
\text{Total} &= 9.7\% 
\end{align*}
\]  

(2)

From a textual point of view, after this step Vienna’s data corresponds to the proposal. The second level of the harmonization procedure deals with the technical aspect of heterogeneous data. As Heidelberg uses a multiple response question, the total percentage of items chosen by the respondents is 115.7% instead of 100% as in Vienna’s guest survey. To consider this aspect each form of transport that already exists in Vienna’s item list is multiplied by the factor of 15.7%. This approach can be adopted assuming that there are no preferences within the items of the multiple response question, i.e. the items of the question are equally distributed. Finally, the data of Vienna’s guest survey concerning the main form of transportation corresponds with ECT’s proposal and can be used for comparative analysis.

<table>
<thead>
<tr>
<th>Table 3. Harmonization steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vienna’s original data</td>
</tr>
<tr>
<td>Private car/ van</td>
</tr>
<tr>
<td>Hired car/ van</td>
</tr>
<tr>
<td>Train</td>
</tr>
</tbody>
</table>
### Table 4. Means of transportation of visitors to Heidelberg

<table>
<thead>
<tr>
<th>Mode</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private car/ van</td>
<td>53.6%</td>
</tr>
<tr>
<td>Hired car/ van</td>
<td>7.6%</td>
</tr>
<tr>
<td>Train</td>
<td>29.7%</td>
</tr>
<tr>
<td>Plane</td>
<td>11.5%</td>
</tr>
<tr>
<td>Boat/ ferry</td>
<td>0.4%</td>
</tr>
<tr>
<td>Bicycle</td>
<td>1.1%</td>
</tr>
<tr>
<td>Motorbike</td>
<td>0.3%</td>
</tr>
<tr>
<td>Public bus/ coach</td>
<td>4.1%</td>
</tr>
<tr>
<td>Private bus/ coach</td>
<td>5.6%</td>
</tr>
<tr>
<td>Walked/ hitch-hiked</td>
<td>0.7%</td>
</tr>
<tr>
<td>Other (specify)</td>
<td>1.1%</td>
</tr>
<tr>
<td>total</td>
<td>115.7%</td>
</tr>
</tbody>
</table>

6. OUTLOOK

6.1 Evaluation of the model

Finally, in order to measure the accurateness of the proposed concept and the overall success of the system, the paper discusses an evaluation strategy which will be conducted in the near future.
An experimental design will be used, consisting of one experimental and one control group of tourism managers, where the experimental group uses reports generated by the CityMIS for responding to the case problem, while the control group will use original reports which were compiled for each individual city. The final result should demonstrate the accurateness and effectiveness of the model, where this effectiveness is defined in terms of achieving its objectives, specifically its role in increasing decision-making effectiveness (Silver 1991). Hence, effectiveness should be evaluated on two criteria: Decision quality and decision-making efficiency.

Decision support systems help decision makers in the process of generating information and help them to avoid the potential mistakes in forming the judgement. Therefore, users of CityMIS should make better decisions. Concerning decision-making efficiency, members of the control group may have to turn to outside resources, leading to more time to make a decision. Therefore, users of CityMIS should make decisions faster. The perceptions of the managers on the impact of the model are measured using a self-reporting questionnaire. All hypotheses are one-tailed with an expectation of improvement in the decision parameter (e.g. speed, organization of thoughts, confidence about decision taken etc.). Persuasive evidence that the use of CityMIS improves the decision-making process is expected.

6.2 Conclusions

The multiple harmonization procedures presented here lead to a quantitative model integrating guest survey data from various cities and offering a way to perform on-line data comparisons. The model is conceptualized as a retrieval system for storage and access to key marketing variables by a user-friendly interface. Information can be accessed via the Internet and statistical operations can be computed for a subset of cities or for all cities in the database (Figure 3).

Fig. 3. CityMIS output

Advantages of this City Tourism Marketing Information System are:

- The increased sample size that will generate more precise estimates of relevant effects and facilitate subgroup analyses that were not possible before.
• Comparing findings of diverse studies can increase evidence of the generalizations of the studies, generate new hypotheses and direct attention to areas which need further research.
• Meaningful comparative analyses give tourist managers the opportunity to develop strategies taking into account the competitors’ situation.

Although the model offers its users a wide variety of information and statistical operations one should bear in mind that its output is only the second best solution. “The only really good solution to the missing [comparable] data problem is not to have any. Statistical adjustments can never make up for sloppy research” (Allison 2001: 2). In order to get access to an even more comprehensive database on (city) tourism, efforts should be made to agree on a mandatory survey-proposal to ensure that different sources deliver comparable data. This of course depends on the willingness of all people involved and cannot be enforced immediately. However, the presented Eurocity database in TourMIS offers a good and reliable alternative, stimulates discussion and therefore supports inter-city collaborations in order to create more standardized tourism statistics in the future.
References


