Monitoring Customer Satisfaction by Innovative Statistical Methods and Models with Application to Tourists' Opinions

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Monitoring quality of tourists' opinions is becoming an important issue also for companies providing sport services. The aim in this paper is to apply a new class of models (specifically an extension of CUB models according to Piccolo 2003) and nonparametric permutation methods (according to Pesarin and Salmaso 2010) to a large customer satisfaction survey performed during the winter season 2011-12 on services provided by the ski schools of Alto Adige (Italy). Specifically the parents of young children under the age of 13, who participated in ski courses organized in the Ski Schools, were asked to answer a questionnaire to express their level of satisfaction about some aspects of the service. The data processing is mainly aimed to two goals: 1. To calculate a global index of quality, as synthesis of the customer satisfaction for the various evaluated aspects; 2. To estimate the degree of feeling toward the service and the degree of uncertainty of the respondents and to detect if and how the personal characteristics of the customers can affect these two psychological components, according to the idea that customer satisfaction can measure the perceived quality of the service.

Key words: Customer satisfaction survey, permutation tests, rankings, CUB models, NPC test

Introduction

In the sport tourism field, the customer satisfaction and service quality dimensions are crucial points in order to deliver a high quality service and to be competitive. Measure such dimensions with appropriate tools is therefore of fundamental importance. In a winter sport tourism framework, we propose to measure customer satisfaction and service quality by means of recent developed statistical tools.

A preliminary literature review shows the advances in active sport tourism field with particular attention to service quality studies. The methodology section will present the methods and models applied to tourists’ opinions. Then the case study will be introduced describing a survey performed in order to monitoring customer satisfaction for ski schools’ services.

Literature review

The past decades have seen an increased trend towards more active holidays with a growing interest within academic circles (Smith and Jenner 1990), particularly for the sport tourism field.

One of the Sport tourism definition is “travel for non-commercial reasons, to participate or observe sporting activities away from the home range” (Hall 1992). Weed and Bull (2004) suggest five types of sport tourism: tourism with sport content, sport participation tourism, sport training, sport events and luxury sport tourism. The research is usually guided by the definitions adopted. The definition of “sports tourism” is the starting point in Weed (2009); his paper, a meta-review of 18 reviews from 1990 to 2008, aimed at tracing the different paths taken by researchers in sports tourism field. Delineating the contributions in sports tourism field, Weed (2009) and Weed (2006) describe the “event sports tourism” as the main researched area followed by “active sport tourism”, particularly golf and ski tourism. Golf and ski tourism have been categorized as “active sport tourism” (Gibson 2002) or “sports participation tourism” (Weed and Bull 2004) by several authors (Chaplin 2001, Gibson 2003 and Jackson and Weed 2003). Moreover it is worth to cite some studies that have been dealt with the behaviours of sport tourists. They include: Petrick and Backman’s (2002a, 2002b, 2002c) work on the satisfaction and value perceived by golf tourist; and Williams and Fridgeon’s (2000) research on the barriers that keep many potential skiers off the slopes and trials.

As stated by Chaplin (2001), sports tourism field is “multi-faceted” with authors performing sport tourism researches from different disciplinary perspectives. Weed (2009) invite scholars from other disciplines to contribute to the sport tourism research. Finally, Weed (2009) intended to highlight also the scarcity of studies related to customer satisfaction particularly for winter sports.
In a study on how addressing participation constraint in potential skiers, Williams and Fridgeon (2000) stated that “so much of the breaking down of the barriers to skiing evolve around treating new skiers in friendly and hospitable ways” (p. 390). To accomplish this aspect seems important not only a customer service marketing that make skiers feel comfortable, but also it seems important to evaluate and monitor customer satisfaction and service quality.

Within sport tourism industry, the quality of services provided is a relevant issue in order to be competitive (Kouhtouris and Alexandris 2005, Shonk and Chelladurai 2008). Studies on perception of service quality by participants include the study of service quality within health and fitness centers (Alexandris et al. 2004), golf courses (Crilley et al. 2002), recreational and leisure facilities (Ko and Pastore 2004) and spectator sport (Greenwell et al. 2002a 2002b, Kelley and Turley 2001, McDonald et al. 1995, Wakefield et al. 1996).

Considering service quality, the ways to satisfy customers with quality service can, of course, determine the success of a sport organization (Ko and Pastore 2004). The same concept seems to be relevant to Matzler et al. (2008) in a study on customer satisfaction with alpine areas; they claimed that winter tourism is crucial for eastern Alpine region economy, in particular alpine skiing activities that attract many tourists (Dolnicar and Leisch 2003; Franch et al. 2003, Matzler et al. 2004, Matzler and Siller 2004, Richards 1996, Weiermair and Fuchs 1999, Williams and Fidgeon 2000). Matzler et al. (2008) also reported how “more and more winters with little snow and the rapid growth of long-distance travel (Pechlaner and Tschurtschenthaler 2003) increase competition between Alpine ski areas. In this competitive market environment, destination success depends strongly on a thorough analysis of tourist motivation, customer satisfaction, and loyalty (Yoon and Uysal 2005)” (p. 403).

As a sport participation tourism, in particular a winter sport like skiing, the paper aim to analyze customer satisfaction data by means of innovative statistical tools on several quality aspects of the ski school services in the Alto Adige, a northern Italy Alpine region.

Requirements for high quality service are also specified by ISO 9001 document (2008). The European regulation ISO 9001 states that an organization needs to show its ability to regularly provide a product which satisfies customers’ requirements and wishes to increase customers’ satisfaction. The former seems to be related to monitoring of quality, the latter to improvement of quality.

It is generally accepted and promoted the application of methods like statistical techniques in order to monitor, analyze and improve the service and customer satisfaction. The paragraphs in Data Analysis sub section of ISO 9001 speak for itself: the priority is to provide information regarding customers’ satisfaction. The organization must monitor the information relating to customers’ perception of whether the organization has satisfied their requirement. In order to collect information and monitoring customers’ perception we can use many sources like customer satisfaction surveys.

In such a framework, with sport tourism literature lacking in customer satisfaction studies especially for winter sports and the requirements of ISO 9001, our aim was to monitor and measure customers’ perception of the Alto Adige ski schools by means of innovative statistical analysis such as CUB models (see Piccolo and D’Elia 2005 for the initial idea on such modelling) and NonParametric Combination (NPC) tests (Pesarin and Salmaso 2010).

**Methodology**

D’Elia and Piccolo (2005) have proposed a statistical model, called Mixture Uniform Binomial (MUB) models that has been proven to be a useful tool for analyzing preference data sets in several contexts. The rationale of the model is that the expressed preference is the result both of feeling and uncertainty components, which are different random variables to be combined in a mixture. MUB models with general links for subjects’ covariates have been called Covariates Uniform Binomial (CUB) models. This approach helps in the analysis and the interpretation of statistical data arising from preferences or evaluation contexts. The ranking and rating of an item may be represented as the mixture of two components: the liking or disliking feeling and the uncertainty of the choice process.

The probability distribution of the model (without covariates) is:
Capital R is a random variable that describes the composite nature of the evaluation process and lowercase r is a realization of capital R, with R varies from 1 to m, $\xi \in [0,1]$, $\pi \in (0,1]$ and $m > 3$.

A general formulation of CUB ($p,q$) model is:

$$
\Pr(Y_i = y_i) = \pi \left( \left( \frac{m-1}{y_i-1} \right) (1-\xi)^{y_i-1} \xi^{m-y_i} \right) + (1-\pi) \left( \frac{1}{m} \right)
$$

$$
\pi_i = \frac{1}{1 + e^{-\beta_1 \cdot \beta_2 \cdot \cdot \cdot \beta_p \cdot \gamma \cdot \omega}} = \frac{1}{1 + e^{-\beta_1 \cdot \beta_2 \cdot \cdot \cdot \beta_p \cdot \gamma \cdot \omega}}
$$

$$
\xi_i = \frac{1}{1 + e^{-\gamma_i \cdot \omega_i}} = \frac{1}{1 + e^{-\gamma_i \cdot \omega_i}}
$$

About the feeling component, Iannario and Piccolo (2009) stated that a shifted binomial random variable is an adequate probability model for representing the discrete version of a latent judgment process. About uncertainty component, a discrete uniform random variable is a suitable structure for describing the inherent uncertainty of a discrete choice process. About parameter $\xi$, according to the context, it has been interpreted as the degree of perception, index of selectiveness, etc.

The nonparametric permutation (NPC) method (Pesarin and Salmaso 2010) has been applied to compare two groups in presence of categorical variables using an Anderson-Darling type test in order to compare the variables of two different seasons to identify an improved, constant or decreased trend in perceived quality. This method is defined as nonparametric since it does not need either the knowledge of the underlying statistical distribution for the variables being studied (distribution free), or the dependence structure among variables. NPC method is based on the idea that permuting many times the observed groups and constructing a distribution of the statistic of interest, we can decide to accept or not a difference between groups (for details we refer to Pesarin and Salmaso 2010).

The Case Study: Description and Procedure

A survey was conducted in the ski schools of Alto Adige area. The parents of young children under the age of 13, who participated in ski courses organized in the ski schools, were asked to answer a questionnaire to express their level of satisfaction about some aspects of the service.

This study is innovative at a national level: it is the first systematic study performed in different schools, with qualitative evaluation, using a questionnaire scientifically designed to measure satisfaction and quality perceived by the users. This study was performed in 2011, contacting 38 schools and handing out questionnaires both for kids and adults. In 2012 the ski schools continued to deliver the questionnaires to customers. The questionnaire used is shown in Appendix.

The first part of the questionnaire is about demographics and other questions useful for segmentation and to set the covariates. The second part asks questions about the service. We identified three phases of the service, each with specific quality dimensions:

1. Booking service, with quality measured by: adequate opening times; clarity and completeness of informative brochures and website information; staff clarity and completeness of information provided, courtesy and helpfulness;
2. Course organization: skill homogeneity of groups after selection;
3. Carrying out classes: effective teaching (clarity of notions, courtesy and helpfulness of teachers); safety (adequate slopes and lifts, subjective perception of safety); users’ general satisfaction (enjoyment & fun, increased passion for skiing, kids’ comfort, ...).

Each dimension was investigated with specific questions and adequate scale. Table 1 shows a summary reporting the variables, the range of scale and the quality dimension related to each question.
The statistical analysis followed three steps. First of all we carried out descriptive analysis of winter season 2012 data. Secondly, data of winter season 2012 were compared to data from the winter season 2011 by means of the NPC method in order to detect an improved, constant or decreased level of the service. Finally the CUB model approach was applied in order to better understand the perceived service by users.

## Results

Descriptive analysis (table 2) of 729 kids shows an equal number of male and female, the age group more representative was that between 5 to 7 followed by 8 to 10 ages. The majority of parents had a kid enrolled for the first time. Italians and Germans were in equal number within the sample. We have asked also the reason to enroll the children: the main reason was to learn the basics followed by to improve style. Finally 91.9% of kids had other family members who play winter sports and only 8 % had no family members who play winter sports.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>Scale</th>
<th>Quality dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Booking Time</td>
<td>Response</td>
<td>0-10</td>
<td>Booking Service</td>
</tr>
<tr>
<td>Brochure</td>
<td>Response</td>
<td>0-10</td>
<td>Booking Service</td>
</tr>
<tr>
<td>Staff information</td>
<td>Response</td>
<td>0-10</td>
<td>Booking Service</td>
</tr>
<tr>
<td>Website Information</td>
<td>Response</td>
<td>0-10</td>
<td>Booking Service</td>
</tr>
<tr>
<td>Easy Learning</td>
<td>Response</td>
<td>0-10</td>
<td>Teaching service</td>
</tr>
<tr>
<td>Helpful Teacher</td>
<td>Response</td>
<td>0-10</td>
<td>Teaching service</td>
</tr>
<tr>
<td>Slopes</td>
<td>Response</td>
<td>0-10</td>
<td>Security</td>
</tr>
<tr>
<td>Safety</td>
<td>Response</td>
<td>0-10</td>
<td>Security</td>
</tr>
<tr>
<td>Fun</td>
<td>Response</td>
<td>0-10</td>
<td>Enjoinment &amp; Involvement</td>
</tr>
<tr>
<td>Involvement</td>
<td>Response</td>
<td>0-10</td>
<td>Enjoinment &amp; Involvement</td>
</tr>
<tr>
<td>Experience recommended</td>
<td>Response</td>
<td>0-10</td>
<td>Enjoinment &amp; Involvement</td>
</tr>
<tr>
<td>Homogeneity of group level</td>
<td>Response</td>
<td>0-10</td>
<td>Organization</td>
</tr>
<tr>
<td>Overall satisfaction</td>
<td>Response</td>
<td>0-10</td>
<td>Enjoyment &amp; Involvement</td>
</tr>
</tbody>
</table>

Table 1. Variable names, type of scale and quality dimension referred to the variable.

The summary of the NPC analysis is shown in figure 1. The bar chart (Mean scores-figure 1) shows the means for each question, the brown bars refer to the season 2011 and the blue ones refer to the season 2012. The season 2011 data were compared to the season 2012 data by means of the NPC method ($p$-values < 0.1). The $p$-values indicate that the difference was significant, the “n.s.” indicates a non-significant difference.
The colors refer to service quality dimensions. We have pointed out a constant level when results was not significant, an improvement when results showed a better performance for season 2012 with respect to season 2011 and at the end a decreasing in the case of worse performance for season 2012.

In the teaching dimension, all variables were not significant while among the other dimensions at least two variables for dimension were significant. We observed higher mean values for season 2012 with respect to season 2011 except for the course organization dimension. That dimension refers to homogeneity of group level, a way to organize ski class with respect to the level of learning. In 2012 season course organization dimension has received worse scores with respect to 2011 season.

The table 3 shows the covariates we used to applying a CUB model, in order to identify group differences.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Covariate</td>
<td>0: female; 1: male</td>
</tr>
<tr>
<td>Age</td>
<td>Covariate</td>
<td>Discrete numeric</td>
</tr>
<tr>
<td>Nationality</td>
<td>Covariate</td>
<td>0: foreigner; 1: Italian</td>
</tr>
<tr>
<td>First Presence</td>
<td>Covariate</td>
<td>0: no; 1: yes</td>
</tr>
</tbody>
</table>

Table 3. Covariates used in the CUB model.

A CUB model with 4 covariate for parameter ξ was applied for each response variable; estimates of π were very close to 1. Estimates and p-values of Wald test of covariate coefficients for ξ are reported only if significant.

Table 4 and table 5 present the CUB (0,4) output. The coefficients and p-values reported represent the covariates that better discriminate individual responses to variables along the liking dimension. Age in season 2011 was significant for variables like fun, involvement and overall satisfaction. In the liking dimension of the variables booking time, staff information and easy learning there was a significant difference between Italians and Germans for seasons 2011 and 2012. About season 2011 there was a difference between Italians and Germans also in brochures, slopes and homogeneity of group level, the last
variable showing a negative coefficient that indicates a dimension more liked by Italians with respect to Germans. The first presence has influenced the liking dimension of several variables both for season 2011 and 2012 with the negative coefficients indicating the variables more liked to first presence customers with respect to at least second presence customers at the ski school. Finally the liking dimension of easy learning variable was statistically significant both for nationality and first presence covariates in each season considered.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Gender 2012</th>
<th>Gender 2011</th>
<th>Age 2012</th>
<th>Age 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Booking time</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Brochure</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Staff information</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Website information</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Easy learning</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Helpful teacher</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Slopes</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Safety</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Fun</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>-0.15 (0.0007)</td>
</tr>
<tr>
<td>Involvement</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>-0.12 (0.005)</td>
</tr>
<tr>
<td>Homogeneity of group level</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Overall satisfaction</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>-0.078 (.039)</td>
</tr>
</tbody>
</table>

Table 4. Variable and covariates (gender and age) with estimates and p values of Wald test for parameter $\xi$.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Nationality 2012</th>
<th>Nationality 2011</th>
<th>First 2012</th>
<th>First 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Booking time</td>
<td>0.24 (0.00014)</td>
<td>0.158 (0)</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Brochure</td>
<td>n.s.</td>
<td>0.0817 (0.009)</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Staff information</td>
<td>0.13 (0.035)</td>
<td>0.1 (0.0014)</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Website information</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>-0.08 (0.026)</td>
</tr>
<tr>
<td>Easy learning</td>
<td>0.247 (0.0001)</td>
<td>0.11 (0.0002)</td>
<td>-0.366 (0)</td>
<td>-0.236 (0)</td>
</tr>
<tr>
<td>Helpful teacher</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Slopes</td>
<td>n.s.</td>
<td>0.081 (0.01)</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Safety</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Fun</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Involvement</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>Homogeneity of group level</td>
<td>n.s.</td>
<td>-0.10 (0.0013)</td>
<td>n.s.</td>
<td>-0.21 (0)</td>
</tr>
<tr>
<td>Overall satisfaction</td>
<td>n.s.</td>
<td>-0.158 (0.043)</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

Table 5. Variable and covariates (nationality and presence) with estimates and p values of Wald test for parameter $\xi$.

The CUB model without covariates allows to set out a preference parameter space (figure 2) with parameter $\xi$ on y axis and parameter $\pi$ on x axis.
Figure 2. Dots in parameter preference space correspond to each variable, while colors are referred to quality dimensions.

The more $\pi$ is located to the right side of the unit square, the more respondents are inclined to give final answers (uncertainty is low). The closer $\xi$ is located to the border of the upper region of the unit square the less the item has been preferred.

The colors plus the black square represent the service quality dimensions of the thirteen variables. In general more final answers has been given by customers in season 2011. However for season 2012 the service was slightly better preferred except for course organization dimension. Another point that the graph shows is that the fun & interest and the safety & care of ski slopes dimensions were the most liked dimensions for both seasons.

The gender and age were not significant except for fun, involvement and overall satisfaction variables in season 2011.

Discussion and Conclusions

A large survey involving 38 ski schools of the Alto Adige area was performed in the winter seasons 2011 and 2012. Questionnaires were delivered to parents of kids enrolled in the ski schools, finally data were analyzed by means of two statistical tools: a nonparametric permutation test and a CUB (0,4) model. The nonparametric permutation test was adopted to detect differences between winter seasons 2011 and 2012 with respect to quality dimensions and customer satisfaction. A CUB model was applied to the questionnaire variables in order to analyze the perceived service by the customers.

With reference to our case study, the majority of the variables improved in the season 2012, except for the course organization quality dimension that received lower scores with respect to the season 2011. The teaching variables were constant with respect to the season 2011. From the parameter space of the CUB model it can be see how customers perceived the different aspects of the service. In the liking dimension ($\xi$ parameter) there was a similar trend with respect to the season 2011 with fun and interest dimensions more liked than others and the teaching variable “helpful and polite teacher” as the more appreciated aspect of the service. However there was a slightly different trend in the uncertainty dimension ($\pi$). All customers responded in a less final way with respect to the season 2011, particularly for the course organization dimension.

Finally nationality was confirmed as the more influential covariate on the responses. A possible reason may be the different way to perceive quality by Germans respect to Italians. Also the first presence covariate was influential with respect to the perceived quality and satisfaction of the service. The first presence customers appreciated, and maybe perceived, in different manner the service.
Our integrated approach combining NPC with CUB models allowed us to permit to monitor quality dimensions of a service in a more deep way, detecting the strength and weakness in order to improve the service. Moreover they are useful to understand how customers perceive the service and how they are satisfied. An overall and deep understanding of a service is crucial for continuous monitoring of quality according to ISO 9001 standards.

References


# APPENDIX

## QUESTIONNAIRE FOR CHILDREN (With age less than or equal to 12 years old)

### GENERAL INFORMATIONS

1. **Child’s sex:**
   - 1. Male
   - 2. Female

2. **Child’s date of birth:**
   - [ ] say
   - [ ] month
   - [ ] year

3. **Child’s nationality:**
   - [ ] Italian
   - [ ] German
   - [ ] Other

4. **Province of residence (if Italian):**

5. **Is this the first time you enrol your child in a course of winter sports:**
   - [ ] Yes
   - [ ] No

### OPINIONS ON THE BOOKING OFFICE AT THE RESORT:

1. **Opening times are adequate:**
   - [ ] Not very
   - [ ] Very

2. **Brochures are clear and comprehensive:**
   - [ ] Not very
   - [ ] Very

3. **Information provided by staff was clear and comprehensive:**
   - [ ] Not very
   - [ ] Very

4. **Information available on the website of the School is clear and comprehensive:**
   - [ ] Not very
   - [ ] Very

### OPINIONS ON THE COURSE ORGANISATION

1. **You have seen an improvement in your child’s skiing ability:**
   - [ ] Not very
   - [ ] Very

2. **The instructor was polite and helpful:**
   - [ ] Not very
   - [ ] Very

3. **Slopes and structures used during lessons were suitable:**
   - [ ] Not very
   - [ ] Very

4. **You feel that the lessons were carried out in a safe environment for your child:**
   - [ ] Not very
   - [ ] Very

5. **Your child had fun during the lessons:**
   - [ ] Not very
   - [ ] Very

6. **The course has further increased your child’s interest in skiing:**
   - [ ] Not very
   - [ ] Very

7. **You would recommend this experience to other parents:**
   - [ ] Not very
   - [ ] Very

8. **After selection, participants were of a similar level (same course entrance only):**
   - [ ] Not very
   - [ ] Very

9. **Your overall satisfaction level with this experience was:**
   - [ ] Not very
   - [ ] Very

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Exclusive use Board of Professional Ski Instructors of the Province of Bolzano — University of Padua