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Decision tree models for profiling ski resorts' promotional and advertising strategies and the impact on sales

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ABSTRACT

Based on survey data, this paper builds decision tree models to profile the online and mobile technologies and services that ski resorts use for their promotional and advertising strategies for two important segments, namely millennials (less than and equal to 35) and non-millennials (greater than 35). The technologies and services include resort websites, microblogging services, and online coupon services. The decision tree models reveal that ski resorts use specific strategies for these segments. Also, the paper reveals the impact that the technologies and services have on resort sales. The impact is positive and both immediate and sustained in nature. The research is the first of its type in the ski industry and represents a novel use of decision tree models for profiling promotional and advertising strategies.

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1. Introduction

Ski resorts often use a variety of communication approaches, including advertising, sales promotion, and public relations, to communicate with their primary market segments. e-Commerce, m-commerce, and the proliferation of digital devices are making new digital communication channels available to ski resorts. For example, ski resorts can use resort websites, Groupon (i.e., an online coupon service), and Foursquare (i.e., a location-based service) for promoting and advertising to online followers and prospective customers. Currently, ski resorts are struggling to develop integrated promotional and advertising strategies that employ the available online and mobile technologies and services. This is due to the fact that ski resorts do not understand current practices (i.e., what other ski resorts are doing) and how those practices affect sales.

Knowledge discovery in databases (KDD) and data mining (DM), which combine databases and machine learning, may identify best practices (Fayyad & Stolorz, 1997). The primary KDD/DM steps are dataset construction, data mining (i.e., model building), model assessment, and interpretation of results. Other researchers (e.g., Wu, Kao, Su, & Wu, 2005) have used the methodology to analyze customer datasets for the purpose of generating decision rules for cross-selling or up-selling insurance products. Companies can acquire datasets from a variety of sources, including customer databases, internal transaction data (e.g., point of sale data), and/or

survey data. Depending on their objective, including clustering, classification, or association, companies can apply one or more DM algorithms, including clustering, decision tree, and association rule algorithms, to build specific models to accomplish their objective. For example, if an objective is to identify customer segments, companies could use a customer dataset (e.g., customer account data) and the *k*-Means algorithm to develop a clustering model that would explicate customer segments.

Several researchers (e.g., Levin & Zahavi, 2001) have used RFM attributes, for regency (i.e., time since last purchase), frequency (i.e. frequency of purchase), and monetary (i.e., total customer spend), respectively, to build and evaluate decision tree models for profiling and predictive modeling. The models identify the attributes (i.e., profiles) of customers that constitute predefined segments (e.g., buyers and non-buyers) and, in so doing, predict customer responses (e.g., buy). Although there are other customer-related attributes (e.g., age), RFM data is readily available in marketing and sales databases. As this previous research demonstrates, decision tree models offer a convenient and powerful way for profiling customers and building customer response models.

This study uses decision tree models to profile the online and mobile technologies and services – hereafter referred to as just technologies and services – ski resorts employ for promoting and advertising to two customer segments, namely millennials, or Generation Y (less than or equal to 35 segment), and non-millennials (greater than 35 segment).¹ The profiles reveal the promotional

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E-mail addresses: p.duchessi@albany.edu (P. Duchessi), eitel.lauria@marist.edu (E.J.M. Lauría).¹ There are no precise dates for when the millennials start and end; however, the popular press uses beginning birthdays from the late 1970s and early 1980s.

and advertising strategies that ski resorts use to communicate with two important demographic segments. Because this investigation is technology oriented, we exclude non-digital, communication approaches (e.g., direct mail campaigns). Thus, the research is about profiling promotional and advertising strategies rather than customers, as past research has done. To our knowledge, there are no empirical studies about the technologies and services that ski resorts use for promotional and advertising purposes, making this study a unique application of decision tree models.

The study addresses several important research questions. First, what technologies and services do ski resorts use as part of their promotional and advertising strategies? Generally, anecdotal information is available in the popular press, trade magazines, and marketing and advertising blogs. Second, do the technologies and services employed by ski resorts have a positive impact on sales? Although many of the technologies and services may have a favorable impact on brand development, do they actually increase sales? Is the impact temporary or sustained in nature?

After a review of related research, this paper overviews the technologies and services that ski resorts may use as part of their promotional and advertising strategies. Next the paper describes the dataset, decision tree algorithm, namely C5.0, and the actual decision tree models that result from applying the algorithm to the dataset. Then the paper discusses the impact of various technologies and services on ski resort sales. Finally, the paper discusses the implications for ski resorts, provides a summary, and offers several concluding comments.

2. Related research on decision tree models for profiling

A review of the marketing, DM, and decision support literature reveals that cluster analysis and decision trees are the two primary means for profiling purposes. Relative to cluster analysis, decision trees are relatively new and require that investigators have predefined classes, or segments, prior to developing the profiles.

Cluster analysis combines records into groups with high similarity. Partitional algorithms (e.g., *k*-Means) partition all records into *k* groups, while hierarchical algorithms produce a nested arrangement of groups. Each group of records represents a cluster or segment. One study has used cluster analysis to profile customers and define market segments based on frequency and monetary value of customer transactions (Migueis, Camanho, & e Cunha, 2011).

A decision tree model consists of branches and leaf nodes. The branches represent the values of relevant attributes and the leaf nodes represent specific classes, or segments. Paths through a decision tree model are rules that portray profiles. Some researchers (e.g., Levin & Zahavi, 2001) have used decision tree models to profile customers, given buying and non-buying segments. Other researchers (e.g., Olson & Chae, 2012) employ a decision tree model to profile customers using RFM attributes, given response and non-response – to a direct marketing campaign – segments. One study (Lee & Park, 2005) uses a multi-agent-based system for identifying a highly-profitable customer segment and profiling the associated customers using socio-demographic attributes.

Two studies are closely related to the current study, in the sense that they aim to identify the attributes of marketing or service strategies for specific segments. One study (Kim, Jung, Suh, & Hwang, 2006) builds a decision tree model that identifies customer attributes for low- and high-potential value customers. The profiles may help companies devise marketing strategies for migrating low-potential- into high-potential-value customer segments. The other study (Min, Min, & Eman, 2002) formulates decision tree models that profile the hotel services most appropriate for specific customer segments. The decision tree models allow hotels to develop service menus for retaining distinct customer groups. For

example, one decision tree model reveals that hotels should offer specialty shops, especially when the hotel serves a large segment of female tourists.

Another study (Ngai, Xiu, & Chau, 2009) provides a comprehensive review of the literature – 87 articles in total – on DM as applied to customer relationship management (CRM). The study reveals that decision trees are the most commonly applied models for profiling purposes, because decision tree models determine the effectiveness of specific strategies through the prediction of specific behaviors.

3. Online and mobile technologies and services for promotions and advertising

There are a number of technologies and services available for promotions and advertising. The primary technologies and services for promoting and advertising can be grouped into the following categories: websites, social media networks, microblogging services, distribution/sharing services, quick response (QR) codes, online group coupon services, location-based services, text messaging, paid online advertising, and resort applications (i.e., apps).

Ski resorts heavily use their websites for promoting and advertising (Duchessi & Kahl, 2012). Social media networks (e.g., Facebook) provide an online means for ski resorts to engage ski enthusiasts and share information, including text, pictures, and even videos. Microblogging services (e.g., Twitter with a limit of 140 characters/tweet) allow ski resorts to send and receive small amounts of content, including text, images, and links. These services offer the quickest way to distribute promotions and advertisements to customers that may be interested in a resort's services, events, and ideas. Distribution/sharing services (e.g., YouTube) allow ski resorts to post and share content, including text, photos, and videos, and distribute links to their websites, without the need to incur hosting and bandwidth expenses. QR codes are two dimensional bar codes that appear on billboards and in magazines and link to URLs, including websites, video channels, and photo boards. QR codes allow ski resorts to attach rich data to hardcopy media. Online group coupon services (e.g., Living Social) allow ski resorts to offer deals (e.g., discount promotions on lift tickets) and build brand awareness. Location-based services (e.g., Four Square) allow ski resort customers to "check in" on arrival and complete specific tasks via game mechanics to earn points for virtual badges or special rewards at the ski area. Using geolocation technology, location-based services offer special promotions and advertisements to customers in close proximity to the ski resorts. Text messaging offers a convenient and low-cost approach for advertising over smart phones. Ski resorts may use one or more of the above technologies and services for their promotional and advertising strategies. After resort websites, the most popular technologies and services are social media networks, and microblogging services (Duchessi & Kahl, 2012).

4. Dataset and algorithm for profiling

During the 2010–2011 ski season, the US and Canada had approximately 486 and 123 operating ski resorts, respectively.² US³ ski resorts serviced about 20 million skiers and almost 60% of the skiers were millennials.⁴ A 2011 survey conducted by Ski Area

² National Ski Area Association (NSAA), <http://www.nsaa.org/nsaa/press/operating-ski-areas.asp>, November 29, 2012.

³ 2010–2011 Operations Report, Canadian Ski Council, [http://www.skicanada.org/_assets/files/10-11%20CSC%20Operations%20Report\(5\).pdf](http://www.skicanada.org/_assets/files/10-11%20CSC%20Operations%20Report(5).pdf), November 29, 2010.

⁴ SnowSports Industries America (SIA), <http://www.snowsports.org/Retailers/Research/SnowSportsFactSheet/>, November 29, 2012.

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