

**Developing a Computational Tool for the  
Hospitality Industry**

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**Abstract**

The importance of databases has been increasing in the hospitality industry and data mining, as one of effective computational tools, is introduced to facilitate what its industry's needs due to its benefit for managing large and complex buyer behavior in customer databases. Nowadays, hospitality industry is encouraged to adopt Customer relationship management (CRM) to maintain relationship with their targeted customers. This study aimed to understand and explore the application of data mining in CRM in Taiwanese hospitality industry because this business sector is highly competitive market in recent years. A semi-structured and face-to-face interview method was used in order to explore the perceptions of Marketing Director or Service Director. The findings showed that the data mining technology was essential for the development of long-term relationships with customers in the hospitality industry. It also suggested a proposed data mining process for small and medium sized hotels.

**Key words:** Data mining, Customer Relationship Management, Hospitality

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**Introduction**

In recent years, computational technology has brought dramatic changes to consumers, industries, and organizations worldwide. The world has turned from the era of labor to the era of computers, Internet, and wireless. Productivity growths will no longer rely on human labor but on computational technology for the integration of data mining, energy management, and knowledge-based systems design. Computational technology not only refers to equipment or engineering applications, but also represents the use of organizational systems. Recent and rapid changes in this technology have entered into the hospitality industry as well, with more interactive information sharing, customer relationship management, and productivity software. As stated by Cho and Olsen (1998) and Nyheim, McFadden, and Connolly (2004), hospitality organizations are likely to improve their organizational performance and strategic competitiveness with computational technology. DiPietro and Wang (2010) identified the top five primary reasons for implementing technology in the hospitality industry: productivity improvement, enhanced guest services, revenue generation opportunities, cost reduction and savings, and competitive pressures.

Therefore, hotels should give importance regarding the application of computational technology into their organizations because these systems can develop a hotel's competitive advantage, and thus contributing to the success of organization. Among an array of computational technology, data mining is outstanding as it offers several advantages for hotels of all sizes, for instance, increased effectiveness due to cost reduction and revenue growth, and the expansion of higher quality customer relationships (DiPietro & Wang, 2010).

Faced with the pressures of a severe economic recession, hotels in Taiwan have been seeking for competitive advantages in order to survive and continue their businesses in the hospitality industry. Data mining, a promising computational tool relating to Customer Relationship Management (CRM), is deemed to be an appropriate method for customer-oriented organizations particular in competitive environments where this technique can be employed to enhance the level of service to existing customers and to attract new customers through targeted marketing initiatives. Nevertheless, data mining by banks, shopping centers, and department stores has been widely discussed in the academic literature (Hormazi & Giles, 2004) but only a few studies regarding data mining in hotels have been explored.

Nevertheless, CRM has made clear the importance of strategic management for hospitality organizations. CRM requires a comprehensive analysis of consumer behavior (Kotler, 1997; Kotler & Keller, 2009) but hotels struggle with difficulties to analyze and segment customers without a suitable technique. The research has shown that in order to succeed in CRM, the hospitality industry must apply data mining to obtain information that makes it possible to develop better and closer interactions with customers. Forcht and Cochran (1999) suggested that data mining is an effective technique for tracking hotel customers' patterns of behavior and for discovering information within a database that can be used to inform management decisions. It is an analytic process designed to explore data, normally large amounts of data, in search of consistent patterns or systematic relationships between variables.

The objective of this research is to examine the application of data mining in CRM in Taiwan's hospitality industry. Hotels in Taiwan are under pressure due to competition not only in the industry but also with other types of accommodation providers. Thus, hotels have recognized the need to develop successful customer relationships with guests. The literature review outlines the nature of the data mining concept and its use as part of CRM. The study involved semi-structured interviews with the managers of thirty-three hotels in Taiwan to examine the extent to which data mining has been applied to CRM in the hospitality industry in Taiwan.

### **The Hospitality Industry in Taiwan**

The World Tourism Organization (WTO) reported that tourism has become a major source of foreign revenues in many countries (World Tourism Organization, 2003). According to the Government Information Office (Taiwan Today, 2010), 4.4 million people visited Taiwan in 2009, which generated income of about US\$12.5 billion. The main reasons for visiting the country were sightseeing, business, and visiting relatives and the average visitor's daily expenditure in Taiwan was about US\$210 with the cost of

accommodation accounting for about 45 per cent. According to Go, Pine, and Yu (1994), the intense competition in the hotel industry has been caused by long-term overbuilding and the resultant excess capacity.

The international tourist hotel industry in Taiwan has been expanding since 1970, supported by the Taiwanese government, which has actively promoted tourism. Hotels in Taiwan can be classified into four groups according to standards of accommodation: international tourist hotel, ordinary tourist hotel, ordinary hotels, and hostels. As of the end of May 2009, Taiwan had 63 international tourist hotels with a total of 18,348 rooms. There were 31 tourist hotels with 3,672 rooms, and 5,464 other types of hotels and bed and breakfast hostels with a total of 117,256 guest rooms. The sector is expected to experience considerable further growth as there are 38 international tourist hotels in the planning stage with an estimated 11,034 guest rooms. This investment of nearly US\$2.62 billion will make competition among the international tourist hotels even more aggressive in the future (Sourcingtaiwan, 2010).

### **Data Mining**

The effective use of databases requires a method for collecting, storing, and analyzing large amounts of data (Peacock, 1998). Min, Min, and Emam (2002) defined data mining as a process of searching formerly unknown but meaningful information by filtering large data sets and using a combination of pattern-recognition, model building, and validation techniques. It is an interactive computer-based method employing statistics to gather and filter data into a format that is suitable for analysis (Frawley, Piatetsky-Shapiro, & Matheus, 1992; Smith, 2001; Wells, Fuerst, & Choobineh, 1999). The process involves organizing data, checking errors, and eliminating irrelevant data. Afterward, the data are extracted into a specific pattern or trend; then data are verified to determine how well they match. At this stage, the data are ready to be used.

The result of simulations demonstrated by Sun and Li (2011) confirmed that data mining is an effective and efficient technology for a service firm to transform customer information into customized and dynamic marketing decisions to improve long-term profit. In the study of Wu, Law, and Jiang (2010), a data mining technique was employed to anticipate influential factors affecting the hotel occupancy rate in Hong Kong during the global financial crisis and the H1N1 epidemic from 1996 to 2009. As a result, data mining demonstrated reliable forecasting outcomes.

Data mining has also shown a significant impact on businesses by revealing new patterns of buyer behavior (Forcht & Cochran, 1999), client attributes and purchasing patterns (Shaw, Subramaniam, Tan, & Welge, 2001). It has helped managers better understand the customer information that has been gathered. According to research by Hoontrakul and Sahadev (2008), they reported that data mining made it possible to identify patterns of on-line customer enquiries. Harrah's Hotels and Casinos in Las Vegas introduced a trademarked loyalty-card program, "Total Rewards", which tracks customer's purchasing activities and provides rewards that encourage spending at Harrah's properties. Harrah's used an information system called WINet to link all its properties, allowing the firm to collect and share customer information among them. The process effectively changed the corporate culture from an every-property-for-itself mentality to a collaborative,

customer-focused enterprise. The WINet system connects and consolidates customer information from all of the company's transaction, slot-machine, hotel-management, and reservation systems. Based on this information, Harrah's properties designed marketing strategies to retain their customers by offering different sales promotions for different customers. Customers who lived outside the local area received complimentary hotel rooms or transportation, while drive-in customers received food, entertainment, or cash incentives (Loveman, 2003).

In sum, data mining enables the hospitality industry to make more customized allocations and, acting on long-term customer responses, prompts the firm to make proactive decisions that prevent customers from leaving. As a result, hotels can improve customer retention and profit. Hotel management practitioners may gain benefits in employing a reliable computational technique such data mining for their organizations to improve their operations and customize marketing strategies over competitors. However, management must acknowledge that the application of data mining may require the provision of relevant training for staff, as well as sufficient investment in hardware and software systems.

### **Customer Relationship Management**

Many businesses conduct marketing campaigns based on customer relationship management (CRM) (Swift, 2001; Zaltman, 1997) in the belief that improved relationships with customers will lead to greater loyalty, customer retention, and, ultimately, profitability. Customer relationship management (CRM) is a widely accepted and successful strategy universally employed by most organizations for managing interactions with customers; it uses technological applications to assist organizations in achieving their overall business objectives. These objectives are to stay competitive, to attract new customers and retain regular clients, to optimize profits, to reduce the cost structure, and to effectively synchronize customer information (Ronchi, 2009).

According to Newell (2000), businesses should pay special attention to the tourism and hospitality industry because this industry accounts for a significant revenue source in a number of countries around the world. Recently, customers have become more demanding, and thus businesses have striven to retain their loyalty. Consequently, the importance of CRM is increasing because its attributes can ensure that the most appropriate services are being offered and thereafter identify new revenue opportunities. Lo, Stalcup, and Lee (2010) reported on the growing use of CRM by large hotels in Hong Kong where innovations in information technology (IT) have been influential.

In the hospitality industry, customer information is remarkably valuable. Hotel marketing managers use that information in order to customize promotional offers for targeted customers. For example, Howard Hotels & Resorts in collaboration with Fubon Bank offered a joint promotional campaign for their customers in Taiwan through authorized customer loyalty cards, which enabled customers to collect points, qualify for discounts, or redeem the rewards at Howard's properties. By analyzing data collected from loyalty cards, Howard Hotels & Resorts can track customers' purchasing activities. This helped the hotel customize an array of marketing deals and offers for various customer

preferences. As a result, the hotel was able to prevent their valued customers from defecting to competitors.

### **Research Methodology**

A qualitative approach was chosen because the study aimed to conduct a preliminary exploration of the application of data mining in CRM in Taiwan's hotel industry. As suggested by Marshall and Rossman (2006), a qualitative method is an appropriate technique to investigate little understood phenomena, to identify/discover important variables, and/or to generate hypotheses for further research. Taiwan is regarded as one of the most developed and technologically advanced economies in the Asia-Pacific region, and its hospitality industry represents one of the large service sectors in this country.

Data collection commenced in 2010, and purposive sampling with a snowball technique was employed to explore personal in-depth interviews with senior-level managers or executives of hotels in Taiwan. All potential participants had to meet the criteria of being managers with a marketing or service background and being decision makers relating to innovation for their organizations. In addition, their hotel properties had similar characteristics in terms of number of guest rooms, city-center location, and good reputation among hotel customers. Of the fifty hotels invited to be part of the study, thirty-three agreed to participate, yielding a response rate of 65 percent.

A semi-structured and face-to-face interview approach was adopted in order to explore the perceptions of hotel management executives such as the Marketing Director or the Service Director. Semi-structured interviews allowed the interviewer to add supplementary questions to probe, or get a deeper insight into, the content and meaning of the answers given (Cavana, Delahaye, & Sekaran, 2001). After initially exploring general topics, more directed questions were asked as the conversation developed and opportunities arose to discuss the pre-determined issues. The questions attempted to gain insight into the respondent's knowledge of data mining and its application in hotels, particularly how the sector was using data mining in relation to CRM in their organizations. The interviews were performed by a single interviewer, ensuring that the purpose of the study was presented in a consistent manner and to avoid biasing the research with a second researcher. Importantly, the interviewer sought to create an atmosphere in which participants felt free to describe their opinions. The interviews with these participants were first recorded and then transcribed for data analysis. However, the size of the sample indicated that this was an exploratory study but the results would provide a basis for further research in this area.

### **Results and Recommendations**

All thirty-three participating directors confirmed that computerized database systems were used in their businesses to store guest records, and they indicated that they were aware of data mining. Based on the information given, all participants agreed that data mining was essential for the development of long-term relationships with customers and that it was used to target promotions to frequent customers and to schedule hotel amenities that consumers felt were most important. All the interviewees showed a preference for data

mining as a hotel information source in improving customer service and reducing costs. In addition, they all considered data mining important to maintain strong relationships with the channel members. The wholesale and retail tourist agents were viewed as an extension of the sales team. A key role for channel members was to bring new business to the hotels. In terms of their hotels' relationships with customers, all directors agreed with the notion that customer retention is their priority. They believed that "if you can keep your customers, they will generate new business by word of mouth for you." This statement may imply that hotels need to understand that data mining technology alone does not guarantee marketing success. Further, over half of interviewees argued that data mining simply cannot replace face-to-face interactions between hotel staff and customers. As stated by Ohmae (1999), improved insight could sometimes be gained by talking to three customers for two hours instead of analyzing data about a thousand customers.

According to the interview results, it was clear that hotels have already attempted to make use of the data mining technique. All directors agreed that the improvement brought about by data mining was beneficial in retaining customers for hotels. The directors interviewed also shared the opinion that data mining could serve as a tool to establish, maintain and enhance long-term relationships with customers. Nevertheless, the majority of directors claimed that many small and medium-sized hotels in Taiwan still have not employed data mining to compile and analyze information about their customers. Therefore, the present research is deemed to propose a process of data mining that sounds practical for small and medium-sized hotels to optimize their competitiveness. The following four steps are described below.

**Step 1:** Gather customer data from accommodation bookings and the membership registration process. In room division, catering division or boutique, it is possible for hotels to retrieve other valuable information from hotel records such as special requests, frequency of stay, and spending behavior.

**Step 2:** Use data mining to compile information from collected data related to each customer's purchases or demands. Using classification techniques, customers are arranged into pre-defined segments that allow the size and structure of groups to be monitored. In the end, a marketing analyst could use the demographic information to allocate customers to segments.

**Step 3:** Identify the targeted segment(s). Use data mining to identify groups of customers with similar behaviors and track as well as measure customers' reactions to different offers. CRM strategies can be devised after this step and used to establish good lasting relationships with customers.

**Step 4:** Improve services according to the responses collected from the targeted campaign so that high-profitability customers can be retained. Use data mining to customize the services according to their preferences.

More importantly, the hospitality industry should be aware of upcoming technology trends. In today's business environment the Internet and wireless appear to be new platforms for communication. The new technology enables hotels not only to monitor consumer expectations, but also to more efficiently provide customized service. For example, low-cost or even free-of-charge Internet access points will soon become common for hotel guests' expectations in the hospitality industry. Additionally, mobile technology allows consumers to browse relevant information and complete transactions at any location

24 hours a day. Thus, modern hospitality organizations need to get connected to potential and existing customers via these interactive channels in order to maintain their competitiveness. Small and medium-sized hotels are strongly recommended to take advantage of their distribution capabilities such as content dissemination, feedback collection, interactivity, and one-to-one marketing. These processes will gradually generate long-term revenues and later reduce the cost structure.

### Conclusion

It should be noted that a considerable amount of academic work regarding data mining is a mainly technology-oriented approach, whereas the present research explored a different angle on how and why data mining is used as computational tool for a particular industry, hospitality, and whether the data mining is aligned with hospitality organizations' CRM policies.

The personal in-depth interviews with hotel management executives offered interesting insights into the issues of data mining and its potential as a tool of marketing and CRM in the hospitality industry. The interviews revealed that data mining will become a practical and useful technique for the development of customer relationships in the hospitality industry in the near future. Gaining a competitive advantage through customer knowledge is a key task for strengthening CRM in the Taiwanese hospitality industry. To achieve viable CRM, hotel management practitioners must identify and establish a long-term relationship with the most profitable customers. Data mining is indispensable in this regard. Small and medium-sized hotels should not overlook the warning of being left behind if large hotels continue to develop data mining capabilities and customer relationship management programs. This research also strongly urges that small and medium-sized hotels should implement the proposed data mining process as a roadmap in establishing their CRM strategies.

By means of this proposed data mining method, small and medium-sized hotels can identify heterogeneous customer preferences, balances short-term service costs, retain long-term regular customers, and optimally maximize long-term profit for hospitality organizations. Future research could investigate how the application of data mining for CRM affects customer satisfaction. Such findings will contribute to the body of knowledge about the capabilities and implications of data mining.

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