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Financial performance and capacity analysis for the MICE industry in Las Vegas and the United States

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FINANCIAL PERFORMANCE AND CAPACITY ANALYSIS FOR THE MICE INDUSTRY IN LAS VEGAS AND THE UNITED STATES

by

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ABSTRACT

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The meetings, incentive travel, conventions, and exhibitions (MICE) industry is comparatively young and diverse. As a result, there has been limited research conducted in this field, especially from the financial performance and capacity management perspective. The purpose of this study is to fill the gap by analyzing the MICE capacity optimization issue in Las Vegas, a leading MICE destination, and in the U.S., a leading MICE country in the world. The findings and results of this study should help industry practitioners better understand the current status of the U.S. MICE industry in terms of assets efficiency, operational costs, and profitability. The findings of the financial performance analysis indicate that the MICE industry in Las Vegas and the United States has high operating expenses and intensive capital investment which affect its profitability. Moreover, the results of the capacity optimization analysis show that the MICE industry will continuously experience severe over-capacity over the next five years. This study recommends solutions to the capacity problems. Academically, this study should make a good contribution to capacity optimization literature by applying the theoretical model to the MICE industry.

Keywords: MICE industry, Capacity optimization, Single-period inventory model, Cost of over-capacity, Cost of under-capacity

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CHAPTER 1

INTRODUCTION

The meetings, incentive travel, conventions and exhibitions (MICE) industry has been recognized as a significant market segment over the past decades (Astroff & Abbey, 2006; Kim, Chon, & Chung, 2003; Lee, 2006; World Tourism Organization [WTO], 2006). According to the International Meeting Statistics by the Union of International Associations [UIA] (2010), there were 8,871 international meetings in 2006, 10,318 in 2007, 11,423 in 2008, and 11,929 in 2009. It shows an upward trend worldwide. The industry consists of multi-sectors of hospitality service including lodging, food and beverage, catering, convention service, convention facility supply, transportation, tourism, retail, and entertainment (Astroff & Abbey, 2006; Fenich, 2008). The MICE industry shares several common characteristics with hospitality service sectors, such as inseparability of production and consumption, perishability, and seasonality (Astroff & Abbey, 2006). Moreover, the MICE industry of a destination always faces uncertain markets due to fluctuations in the economy and competitions from rivaling destinations. Therefore, the demand for a MICE destination should be considered as probabilistic rather than deterministic. The uncertain demand for the industry makes its financial performance unstable and its capacity management challenging.

The MICE industry is an important contributor to regional and national economies (Rutherford & Kreck, 1994; WTO, 2006). The industry provides host cities and regions with great commercial and industrial opportunities in many sectors, such as lodging, food and beverage, catering, convention service, convention facility supply, transportation, tourism, retail, and entertainment (Dwyer, 2002; Fenich, 2008; Spiller, 2002). The MICE

industry also creates many job opportunities for regional residents and effective promotion for host destinations. Therefore, the MICE industry can be critical to the economic success of a tourism destination, such as Las Vegas, the top convention city in the U.S. (Center for Exhibition Industry Research [CEIR], 2005), and the U.S., the top convention country in the world (UIA, 2010). According to a recent study by PricewaterhouseCoopers U.S. (2011), the MICE industry contributes $263 billion in annual spending to the U.S. economy, provides $25.6 billion in tax revenue at the federal, state and local levels, and creates 1.7 million jobs for the American workforce in local communities across the U.S.

The *Meetings Market Report* also points out that in the U.S., there were 1,243,600 meetings and conventions with a total meeting attendance of 136,500,000 in 2005 and 1,321,100 meetings with a total attendance of 141,200,000 in 2007 (Braley, 2008). The total aggregate direct expenditure was $107.2 billion in 2005 and $102.9 billion in 2007 (Braley, 2008). Approximately more than 60% of the total aggregate direct expenditure contributes to lodging and food and beverage, 12% to transportation, and 8% to tourism (Braley, 2008). For Singapore, which relies on MICE heavily for its tourism industry, the MICE business contributes even more to the nation's economy. According to the International Enterprise Singapore (2001), every dollar generated by the MICE industry adds another 12 dollars to the national GDP. The contribution made by the MICE industry to the tourism economy is tremendous. Under-capacity could imply great opportunity costs for a destination country, such as the United States.

The MICE industry has exerted a great economic impact on the tourism of a destination. Las Vegas is famous for its casinos, entertainment, tourism, and conventions

and exhibitions. It has been the top convention city in the U.S. since 2005 (CEIR, 2005). According to the Las Vegas Convention and Visitor Authority [LVCVA] (2009e), since 1962, Las Vegas has hosted over 94 million convention attendees who have brought over $101.2 billion to the Las Vegas economy. In 2008, Las Vegas hosted 22,454 conventions with 5,899,752 attendees, representing 15.74% of the total visitors to Las Vegas and bringing over $7.77 billion to the Las Vegas economy (LVCVA, 2009e). The economic impacts of the MICE industry are significant. Under-capacity could imply great opportunity costs for Las Vegas, the top convention city in the U.S (CEIR, 2005).

The reasons that the MICE industry generates great economic impacts are (1) the number of attendees for a convention is large; (2) convention attendees tend to stay longer than leisure travelers; (3) convention delegates spend more; (4) convention participants tend to participate in pre- or post-convention activities; and (5) convention and exhibition activities affect various industries (Kim et al., 2003). Therefore, countries and cities compete aggressively to host conventions and exhibitions. The UIA annual international meeting statistics report indicates that in 2009, the top 10 nations hosting international conventions were USA, Singapore, France, Germany, Japan, Belgium, Netherlands, Austria, Italy, and Spain. The top 10 cities were Singapore, Brussels, Paris, Vienna, Geneva, Berlin, Prague, Stockholm, Seoul, and Barcelona (UIA, 2010).

Since the 1980s, the MICE facility development has aggressively expanded in North America. According to a 2008 report by the Hospitality Valuation Services (HVS), MICE facility development in the U.S. and Canada has been continuously underway at an average rate of 3.4% annually (Detlefsen & Vetter, 2008). The *EXPO Magazine* 2008 reveals that there are 40 new convention and exhibition facilities currently under

construction and they will add 7,226,500 square feet of convention and exhibit space to the North American market by the end of 2011 (Gamble, 2008). Expansions of convention facilities have been overwhelming in Las Vegas. The Hotel/Casino Development – Construction Report of September 1, 2010 shows that the total convention facilities in the Las Vegas area reached 10.4 million square feet in 2009, compared with 4.16 million square feet in 1997 (LVCVA, 2010). According to the Las Vegas Convention and Visitor Authority (2010), 178,700 more square feet would be added in 2010. Moreover, while several new projects with a total 5.1 million square feet were proposed by 2009 (LVCVA, 2009b), some of these projects were suspended during the economic downturn (LVCVA, 2010). As a result, approximately 418,500 square feet will be added to Las Vegas MICE facilities by 2014 (LVCVA, 2010; Zind, 2009). The aggressive expansions in Las Vegas and the U.S. increase competition among the MICE destinations. Over-capacity could result in great economic loss due to the enormous capital investment of the MICE facilities, especially in the economic downturn.

The construction or expansion of convention facilities usually takes an enormous amount of capital. For example, the 1.6 million-square feet Las Vegas Convention Center expansion in 2003 cost $195 million or about $122 per square foot (LVCVA, 2009d). The Las Vegas Convention and Visitor Authority Board has approved the Master Plan Enhancement Program for the Las Vegas Convention Center with a budget of $890 million on its 86,616 square feet convention space with 513,000 square feet support space expansion, which will be completed by the end of 2011(LVCVA, 2008b). This enhancement program will cost approximately $1,484 per square foot. The private sector of the Las Vegas MICE industry is also getting more involved in developing their

convention and exhibition facilities. For instance, the Mandalay Bay Hotel and Casino Las Vegas has invested $235 million on its 1.5 million square feet convention and exhibition space, at an average cost of $157 per square foot (LVCVA, 2009f).

When building new convention centers or expanding existing properties, lawmakers, government officials, and stakeholders tend optimistically to believe that the more convention space a city has, the more opportunities it will have to attract convention visitors and make favorable economic impacts on the community (Sanders, 2002). This tendency is likely to augment the risk of over-capacity in the MICE industry. Over-capacity, if prevailing, would inflict great economic loss to the destination thanks to its enormous capital investment, especially during economic downturns. According to the Convention Center Performance Review (Isler, 2008), some well-known U.S. MICE facilities are currently experiencing over-capacity, including the Boston Convention and Exhibition Center, the Georgia World Congress Center, Atlanta, and the Washington Convention Center, Washington, D.C. However, whether over-capacity is becoming a problem for the overall U.S. MICE industry needs to be determined via a careful weighing of the capacity's financial benefits against costs.

Research Questions

This study tends to answer the following questions: (1) what are the financial performances of the MICE industry in Las Vegas and the United States; (2) what is the optimal MICE capacity? An analysis of the financial performance of the MICE industry in Las Vegas and the U.S. could provide an estimate of the industry's capacity efficiency, operating costs, and profitability. Furthermore, using time series analysis and the single-

period inventory model, this study could estimate the optimal capacity for Las Vegas and the U.S. MICE industry, providing a useful guidance for the industry's expansion in the years to come. The null hypothesis is that the expected capacity is the same as the estimated optimal capacity and the alternative hypothesis is that the expected capacity exceeds the optimal (over-capacity) or below the optimal (under-capacity).

Purposes of the Study

The purposes of this study are to evaluate the financial performance of the MICE industry and to estimate the optimal MICE capacity for the industry based on an analysis of the financial benefits and costs of the convention centers and the convention hotels in Las Vegas and the United States. Under- or over-capacity of the industry will be identified based on the estimated optimal capacity.

Significance of the Study

The findings and results of this study should help industry practitioners better understand the current status of the MICE industry in terms of assets efficiency, operating costs, and profitability. The results will also shed light on whether the MICE development in Las Vegas and the U.S. is heading for under- or over-capacity, the magnitude of under- or over-capacity, if any, and how the capacity problems may be corrected. Academically, this study will make a good contribution to capacity optimization literature by applying the theoretical model to the MICE industry.

Definitions of Terms

The MICE industry is comparatively young in the tourism and hospitality industries. Both the industry terminology and measurements have not been well established or consistently applied in the industry (WTO, 2006). For example, in the lodging industry, room night, average daily room rate (ADR), room occupancy rate (OCC), and room revenue per available room (RevPAR) are the standard measures for capacity usage and efficiency. However, in the MICE industry, convention centers, convention hotels, associations, corporate, and convention planners employ inconsistent measures. For instance, "hall" and "square foot" are both used to measure occupancy without being tied with "time" components (WTO, 2006). In the industry, even 26% of meeting planners and the convention space suppliers do not count square foot days used, but only count the number of bookings (International Association of Exhibitions and Events [IAEE], 2007). In order to avoid inconsistency and ambiguity, it is important to clearly and scientifically define measurement terms for the industry.

Based on thorough literature reviews and interviews with managers in the industry and government officials involved in convention operations, the industry terminologies used in this dissertation are defined as below:

Average Daily Rate. Also called average room rate, or ADR, which is room revenue divided by number of rooms sold (Schmidgall, 2010).

Attendees. A combination of delegates, exhibitors, media, speakers, and guests/ companions who attend an event (Destination Marketing Association International [DMAI], 2005).

Conference. An event that is used by any organization to meet and exchange views,

convey a message, open a debate, or give publicity to some area of opinion on a specific issue. Conferences are usually on a small scale and of short duration with specific objectives (Fenich, 2008).

Conference center. A facility that is typically designed to accommodate meetings of between 20 and 300 people (Astoff & Abbey, 2006). It often includes specially designed educational facilities, resting rooms and food service (Fenich, 2008).

Convention. An event where the primary activity of the attendees is to attend educational sessions, participate in meetings and discussions, socialize, or attend other organized events. It is usually in conjunction with an exhibit component (DMAI, 2005). Conventions usually contain general sessions and supplementary smaller meetings (Astoff & Abbey, 2006).

Convention center. A building that is designed to handle larger events. Meeting facilities include halls, flexible exhibit space, break-out meeting rooms, but no sleeping rooms.

Convention hotel. A hotel that provides facilities and services geared to meet the needs of large group and association meetings and tradeshows. Typically, these hotels have more than 500 guest rooms and contain substantial amounts of function and banquet space flexibly designed for use by large meeting groups (Pannell Kerr Forster, 2007).

Convention planner/ meeting planner. Personnel who organize meetings and the related affairs for companies, corporations, and associations (Fenich, 2008). This study uses the term meeting planner.

Delegates. Individuals who attend an event primarily to visit the exhibits or attend meetings and/or conference sessions. This excludes exhibitors, media, speakers, and

companions (DMAI, 2005).

EBITDA. Earnings before interest, tax, depreciation, and amortization (Schmidgall, 2010)

*Exhibition / exhibit***.** An event at which the primary activity of the attendees is to visit exhibits on the show floor. These events focus primarily on business-to-business relations (Convention Industry Council [CIC], 2010). An exhibition is usually held in conjunction with a convention (Astoff & Abbey, 2006).

Exhibitors. A person or firm that displays its products or services at an event (CIC, 2010).

Gross Operating Profit. Also known as GOP, it equals total department income less total undistributed expenses (Schmidgall, 2010).

Meeting. A universal term applicable to all sorts of events where the primary activity of the attendees is to attend educational sessions, participate in discussions and exchange opinions, socialize, or attend other organized events. (Astoff &Abbey, 2006).

MICE. Meeting, Incentive, Conference/Congress, & Exhibition. An internationally used term for the events industry (CIC, 2010).

Occupancy rate. Paid occupancy percentage, the percentage of rooms sold in relation to rooms available for sale (Schmidgall, 2010)

Operating efficiency ratio. Also known as gross operating profit ratio, it is the result of dividing gross operating profit by total revenue. It is a better measure of management's performance than the profit margin (Schmidgall, 2010)

Profit margin. An overall measurement of management's ability to generate sales and control expenses. It is determined by dividing net income by total revenue

(Schmidgall, 2010).

RevPAR. Revenue per available room, calculated as room revenue divided by rooms available (Schmidgall, 2010).

Special event. A one-time event that is staged for the purpose of celebration; a unique activity (Fenich, 2008). It is excluded in this research.

Tradeshow / Exposition/ Expo. An event that is mainly held to display products and /or services (Astoff & Abbey, 2006). These events focus primarily on business-to-business relations (DMAI, 2005).

Summary

The purposes of this study were outlined and the importance and necessity of the financial performance and capacity analysis for the MICE industry were discussed in this chapter. The research questions were identified. The significance of the research was further illustrated. The terms used throughout the dissertation were defined. A review of related literature is discussed in Chapter 2.

CHAPTER 2

LITERATURE REVIEW

Introduction of the MICE Industry

Over the past three decades, the meetings, incentive travel, conventions and exhibitions (MICE) industry has been significantly growing (Astroff & Abbey, 2006; Kim, Chon & Chung, 2003; Lee, 2006; World Tourism Organization [WTO], 2006). The Union of International Associations [UIA] (2010) indicated that there were 8,871 international meetings in 2006, 10,318 in 2007, 11,423 in 2008, and 11,929 in 2009. This upward trend demonstrates the growth of the MICE industry worldwide.

Compared with other industries in the hospitality sector, the MICE industry is comparatively young and dynamic (Fenich, 2008). The industry consists of multi-sectors of hospitality services including lodging, food and beverage, catering, convention service, convention facility supply, transportation, tourism, retail, shopping, and entertainment (Astroff & Abbey, 2006; Fenich, 2008). Therefore, the industry shares several common characteristics with hospitality service sectors, such as inseparability of production and consumption, perishability, and seasonality (Astroff & Abbey, 2006). Moreover, a convention destination always faces uncertain markets due to fluctuations in the economy and competitions from rivaling destinations (Astroff & Abbey, 2006; Fenich, 2008; Isler, 2008). Therefore, the demand for a MICE destination should be considered as probabilistic rather than deterministic.

Importance of the MICE Industry

The MICE industry is an important contributor to regional and national economies

(Dwyer, 2002; Rutherford & Kreck, 1994; Spiller, 2002; WTO, 2006). The industry provides host cities and regions with great commercial and industrial opportunities in many sectors, such as lodging, food and beverage, catering, convention service, convention facility supply, transportation, tourism, retail, shopping, and entertainment (Dwyer, 2002; Fenich, 2008; Spiller, 2002). The MICE industry also creates many job opportunities for regional residents, and effective promotions and publicity for host destinations (Dwyer, 2002; Spiller, 2002).

Many researchers have focused on analyzing the economic impacts of the MICE industry on the host destinations (Dwyer & Forsyth, 1996, 1997; Grado, Strauss, & Load, 1998; Kim et al, 2003; Lee, 2006; WTO, 2006). In the study on the economic impact of the MICE industry on Orlando, Florida, Braun (1992) identified 32 sectors related to MICE and estimated the impact of 1.67 million delegates in 1989 to be more than 65,000 jobs, $457 million in wages, $2.28 billion in output, $88 million in local taxes, and $15 million in state taxes. Kock, Breiter, Hara, and DiPietro (2008) proposed a Regional Impact Based Feasibility Study (RIBFS) framework for the Orange County Convention Center (OCCC) in Florida. The RIBFS model contains aspects of a traditional feasibility study, Input-Output analysis, and all monetary market transactions for consumptions in a given time period. Dwyer and Forsyth (1996, 1997) developed a framework for assessing the economic impact and net benefits of the MICE industry on a national economy. They first identified three different effects of the convention and exhibition activities: the direct effect on suppliers, the indirect effect, and the induced effects. Within this framework, Dwyer and Forsyth (1996, 1997) estimated direct spending, economic output, value added, direct employment, and total employment. Kim et al.

(2003) evaluated the economic impact of international conventions on the Korean national economy in 2001. Their research indicates that the total expenditure of international delegates and convention hosts was approximately $130.4 million. These convention receipts generated $217.3 million in total output, 13,702 in full-time jobs, $47.4 million in residents' personal incomes, $114.6 million value added, $11.9 million in taxes, and $15.6 million in import.

According to a recent study by PricewaterhouseCoopers U.S. (2011), the MICE industry contributes $263 billion in annual spending to the U.S. economy, provides $25.6 billion in tax revenue at the federal, state and local levels, and creates 1.7 million jobs for the American workforce in local communities across the United States. Many of these jobs support working families in the hospitality and food service industries (U.S. Travel Association, 2009). The *Meetings Market Report* also points out that in the United States, there were 1,243,600 meetings and conventions with a total meeting attendance of 136,500,000 in 2005, and 1,321,100 meetings with a total attendance of 141,200,000 in 2007. The total aggregate direct expenditure was $107.2 billion in 2005 and $102.9 billion in 2007 (Braley, 2008). For Singapore, which relies on MICE heavily for its tourism industry, the MICE business contributes even more to the nation's economy. According to the International Enterprise Singapore (2001), every dollar generated by the MICE industry adds another 12 dollars to the national GDP. The contribution made by the MICE industry to the tourism economy is tremendous.

Kim et al. (2003) identify the five reasons that the MICE industry produces great economic impacts are (1) the number of attendees for a convention is large; (2) convention attendees tend to stay longer than leisure travelers; (3) convention delegates

spend more; (4) convention participants tend to participate in pre- or post-convention activities; and (5) convention and exhibition activities affect various industries.

MICE Facility Development in Las Vegas

According to *Las Vegas Market Bulletin* by the Las Vegas Convention and Visitor Authority [LVCVA] (2009e), since 1962, Las Vegas has hosted over 94 million convention attendees who have brought over $101.2 billion to the Las Vegas economy. Table 1 shows the direct expenditures of the MICE attendees from 1997 through 2008. Evidently, the contribution made by the MICE industry to the Las Vegas tourism economy is remarkable.

Table 1

Direct Expenditures of the MICE Attendees in Las Vegas, 1997-2008

Year	No. of Conventions	No. of Attendees	Direct Expenditures
1997	3,749	3,519,424	$4,435,310,677
1998	3,999	3,301,705	4,278,384,800
1999	3,847	3,772,726	4,117,599,068
2000	3,722	3,853,363	4,289,389,724
2001	20,346	5,014,240	5,814,790,386
2002	23,031	5,105,450	5,962,850,147
2003	24,463	5,657,796	6,546,775,778
2004	22,286	5,724,864	6,860,512,075
2005	22,154	6,166,194	7,608,151,056
2006	23,825	6,307,961	8,182,818,340
2007	23,847	6,209,253	8,449,208,768
2008	22,454	5,899,725	7,773,774,124

Note. Adapted LVCVA (2009e). 2001-2008 conventions counts are based on an updated methodology that reflects significant growth in the small meetings market in Las Vegas.

Expansions of convention facilities have been overwhelming in Las Vegas. The Hotel/Casino Development – Construction Report of September 1, 2010 (LVCVA, 2010)

shows that the total convention facilities in the Las Vegas area reached 10.4 million square feet in 2009, compared with 4.16 million square feet in 1997. According to the Las Vegas Convention and Visitor Authority (2010), 178,700 more square feet would be added in 2010. Moreover, while several new projects with a total 5.1 million square feet were proposed by 2009 (LVCVA, 2009b), some of these project were suspended during the economic downturn (LVCVA, 2010). As a result, approximately 418,500 square feet will be added to Las Vegas MICE facilities by 2014 (LVCVA, 2010; Zind, 2009). Table 2 summarizes the MICE capacity development in Las Vegas citywide from 1997 through 2009.

Table 2

MICE Capacity in Las Vegas Citywide, 1997-2009

Year	Square Feet Available	Square foot days Available	% Change
1997	4,161,547	1,518,964,655	
1998	4,846,316	1,768,905,340	16.45
1999	5,960,987	2,175,760,255	23.00
2000	6,097,939	2,231,845,674	2.58
2001	7,609,826	2,777,586,490	24.45
2002	8,891,035	3,245,227,775	16.84
2003	8,928,173	3,258,783,145	0.42
2004	9,252,026	3,386,241,516	3.91
2005	9,622,282	3,512,132,930	3.72
2006	9,455,928	3,451,413,720	-1.73
2007	9,679,527	3,533,027,355	2.36
2008	9,889,171	3,619,436,586	2.45
2009	10,447,572	3,813,363,780	5.36

Note. Adapted LVCVA (1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007a, 2008a, 2009b, 2010). The average growth of MICE capacity was 8.32%.

The aggressive MICE capacity expansions in Las Vegas and the U.S. have raised the risk of over-capacity and increased competitions among the MICE destinations. Over-

capacity could result in great economic loss due to the enormous capital investment of the MICE facilities, especially during an economic downturn. The low utilization rate of the MICE facilities in Las Vegas, as shown in Table 3, may suggest that Las Vegas has been experiencing over-capacity. The average annual utilization rate from 1997 through 2008 was only 57.48%.

Table 3

Utilization of the MICE Capacity in Las Vegas, 1997-2008

Year	Square Feet Available	Square Foot Days Available	Square Foot Days Used	Utilization Rate %
1997	4,161,547	1,518,964,655	877,431,200	57.77
1998	4,846,316	1,768,905,340	873,048,624	49.36
1999	5,960,987	2,175,760,255	871,278,997	40.04
2000	6,097,939	2,231,845,674	908,579,175	40.82
2001	7,609,826	2,777,586,490	2,009,167,500	72.34
2002	8,891,035	3,245,227,775	1,859,753,250	57.31
2003	8,928,173	3,258,783,145	1,868,973,200	57.35
2004	9,252,026	3,386,241,516	1,693,736,000	50.16
2005	9,622,282	3,512,132,930	2,525,556,000	71.91
2006	9,455,928	3,451,413,720	2,408,707,500	69.79
2007	9,679,527	3,533,027,355	2,356,083,600	66.69
2008	9,889,171	3,619,436,586	2,038,823,200	56.33

Note. LVCVA (1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007a, 2008a, 2009b); CEIR (2001, 2005).

MICE Facility Development in the United States

While the MICE industry has rapidly grown since the 1980s, the MICE facility development has aggressively expanded nationwide (Dwyer, 2002; Nelson, 2004; Spiller, 2002; Weber & Chon, 2002). The MICE industry has developed dramatically and has become increasingly competitive on a global scale, some regions, namely North America

and Europe, are reaching market saturation (Detlefsen & Vetter, 2008; Dwyer, 2002; Nelson, 2004; Spiller, 2002). According to Tradeshow Week's 2007 Directory of Major Exhibit Halls (2007), the number of major convention facilities in the U.S. and Canada has increased from 269 in 1986 to 469 in 2007. The total amount of meeting space available has more than doubled from 42.8 million square feet in 1986 to 85.9 million square feet in 2007. The growth rate of the convention space in the U.S. and Canada was 3.4% annually in the 1980s, 3.0% in the 1990s, 4.9% from 2000 to 2004, and 2.2% from 2005 to 2007. The average growth rate was 3.4% (Detlefsen & Vetter, 2008). Tables 4 and 5 show the growth of the convention facilities in the U.S. and Canada (Detlefsen & Vetter, 2008).

Moreover, the *EXPO* magazine points out that currently, 40 new facilities are under construction (Gamble, 2008). By the end of 2011, there will be another 7,226,500 square feet of convention space added to the North American market. Approximately, 3,856,000 square feet of convention space were completed by the end of 2008, and 3,370,500 square feet will be finished by 2011(Gamble, 2008). It is worth noting that not only the existing major convention cities have expansion plans, but also many second-tier cities and suburban areas also plan to build new convention centers within five years (Astroff & Abbey, 2006; Dwyer, 2002; Fenich, 2008; Gamble, 2008; Hultgren, 2009; Isler, 2008; Nelson, 2004; Spiller, 2002). For instance, the Santa Fe Convention Center in New Mexico opened for business in September 2008. The center features 11 meeting rooms, a 17,925-square-foot ballroom, 3,139 square feet of pre-function space within the lobby, and 11,139 square feet of outdoor event space. Nevertheless, while state and city governments are interested in developing their own convention centers, hotels are also

Table 4

Convention Facilities in the U.S. and Canada, 1986-2010

Year	No. of Major Facilities	% Change from Previous Year	Square Feet (Millions)	% Change from Previous Year
1986	269		42.8	
1987	276	2.6	44.2	3.3
1988	319	15.6	45.5	2.9
1989	320	0.3	47.3	4.1
1990	332	3.8	52.0	9.8
1991	338	1.8	54.6	5.0
1992	361	6.8	55.9	2.3
1993	368	1.9	57.7	3.3
1994	366	-0.5	60.6	5.1
1995	369	0.8	63.4	4.6
1996	363	-1.6	63.2	-0.4
1997	362	-0.3	64.2	1.6
1998	364	0.6	64.2	0.1
1999	366	0.5	63.4	-1.3
2000	379	3.6	65.6	3.4
2001	386	1.8	67.6	3.1
2002	402	4.1	72.4	7.1
2003	418	4.0	77.2	6.6
2004	431	3.1	80.5	4.3
2005	452	4.9	82.3	2.2
2006	470	4.0	85.1	3.4
2007	469	-0.2	85.9	0.9
2008	483	3.0	88.5	3.0
By 2010	489	1.2	92.1	2.4

Table 5

Convention Facilities in the U.S. and Canada, Average Percent Change

Period	No. of Major Facilities Average % Change	Square Feet (Millions) Average % Change
1986-2008	2.7	3.4
1986-1989	6.0	3.4
1990-1999	1.4	3.0
2000-2004	3.3	4.9
2005-2008	2.9	2.4

aggressively expanding convention facilities, such as the Sheraton in Phoenix, the Marriott in New York City, and the Wynn in Las Vegas (Hultgren, 2009; Isler, 2008). Oversupply of convention facilities will become a significant threat to the MICE industry (Spiller, 2002).

To track the trend of the major tradeshows using at least 30,000 net square feet, *Tradeshow Week* uses three measures for demand, namely the meeting space square feet used or net square feet (NSF), the number of exhibitors or exhibiting companies, and the number of delegates. Tables 6 and 7 show that over the past 35 years (1972-2007), the amount of net square feet has increased at an average annual rate of 5.4%, the number of exhibitors at 4.5%, and the amount of delegates at 4.4%. Examining the growth rates by decade, it shows that growth in demand was significantly rapid in the 1970s and the 1980s, slower in the 1990s, negative from 2000 to 2003, and resumed growth from 2004 to 2006, with a small decline in 2007 (Detlefsen & Vetter, 2008).

Table 6

Growth in Annual Exhibition Demand, 1986-2007

Year	Square Feet Used[a], % Change from Previous Year	Exhibiting Companies, % Change from Previous Year	Delegates, % Change from Previous Year
1986	6.5	6.0	2.9
1987	5.8	7.2	7.0
1988	7.5	5.7	4.4
1989	5.3	4.9	3.3
1990	3.6	4.0	4.3
1991	-0.6	0.7	0.6
1992	0.5	1.7	1.5
1993	5.1	4.7	4.9
1994	4.6	4.5	5.7
1995	6.2	4.3	3.9
1996	5.0	3.6	4.0
1997	6.8	5.1	6.4
1998	5.8	3.9	2.3
1999	3.9	2.6	3.9
2000	3.1	2.6	4.0
2001	-1.5	-2.7	-5.8
2002	-5.3	-1.8	-2.2
2003	-0.4	0.5	4.2
2004	1.5	1.6	2.7
2005	3.2	1.8	3.1
2006	2.0	1.3	1.9
2007	-0.2	1.6	0.7

Note. [a] Tradeshows with over 30,000 net square feet of exhibit space.

Table 7

Average Annual Growth in Exhibition Demand, 1972 -2007

Period	Square Feet Used[a] Ave. Annual Growth	Exhibiting Companies Ave. Annual Growth	Delegates Ave. Annual Growth
1972-2007	5.4	4.5	4.4
1972-1979	8.5	7.3	7.2
1980-1989	8.3	6.7	5.6
1990-1999	4.1	3.4	3.8
2000-2003	-1.3	-0.4	0.1
2004-2007	1.6	1.4	2.5

Notes. [a]Tradeshows with over 30,000 net square feet of exhibit space.

Detlefsen and Vetter (2008) used the utilization factor to calculate the ratio of demand to supply for the convention facilities in the U.S. and Canada. The utilization factor is the ratio of meeting space demand (annual net square foot days used) to meeting space supply (annual gross square foot days available). The number of annual net square foot days used is computed as the product of the annual number of conventions, the average length of 4 days, and the average size of 127,263 square feet. The number of annual gross square foot days is the product of total meeting space available and the number of days in a year. Thus, 5.2 billion net square foot days used divided by 31.4 billion square foot days available indicates the utilization factor of 16.74% in 2007. Based on the equation, Table 8 shows that the utilization factor for convention facilities in the U.S. and Canada was estimated from 1986 to 2007. The utilization factor significantly increased between 1995 and 1999 while the economic growth also showed upward trends. From 2004 to 2007, the utilization factor of 16.38% was near historic lows (Detlefsen & Vetter, 2008).

Table 8

Utilization Factor Estimates

Year	Square foot days available	Square foot days used	Utilization Factor %
1986	15,607,400,000	2,656,630,282	17.02
1987	16,129,350,000	2,829,311,783	17.54
1988	16,603,850,000	2,993,411,866	18.03
1989	17,279,100,000	3,217,917,756	18.62
1990	18,965,400,000	3,388,467,398	17.87
1991	19,921,700,000	3,510,452,224	17.62
1992	20,388,900,000	3,489,389,510	17.11
1993	21,064,150,000	3,506,836,458	16.65
1994	22,133,600,000	3,685,685,117	16.65
1995	23,144,650,000	3,855,226,633	16.66
1996	23,060,700,000	4,094,250,684	17.75
1997	23,425,700,000	4,298,963,218	18.35
1998	23,440,300,000	4,591,292,717	19.59
1999	23,144,650,000	4,857,587,695	20.99
2000	23,936,700,000	5,047,033,615	21.08
2001	24,674,000,000	5,203,491,657	21.09
2002	26,433,300,000	5,125,439,282	19.39
2003	28,178,000,000	4,853,791,000	17.23
2004	29,382,500,000	4,834,375,836	16.45
2005	30,039,500,000	4,906,891,474	16.33
2006	31,061,500,000	5,063,912,001	16.30
2007	31,353,500,000	5,165,190,241	16.47

According to the studies by the Hospitality Valuation Services (HVS), Detlefsen and Vetter (2008) concluded that the MICE industry has developed dramatically to a mature industry. The demand has slowed since 2001, but convention facilities have continued to expand. The supply of convention facilities exceeds the demand for the facilities nationwide (Detlefsen & Vetter, 2008; Dwyer, 2002; Nelson, 2004; Spiller, 2002). As a result, the facility utilization rates were reaching historic low (Detlefsen & Vetter, 2008). Further, according to the biannual report of the Meeting Market Report (Braley, 2008),

the number of conventions and the number of attendees have increased, but the direct expenditure for the meetings and conventions has declined. The total aggregate direct expenditure was $103 billion in 2003, $107.2 billion in 2005, and $102.9 billion in 2007, respectively (Braley, 2008). It indicates that the revenue of the MICE industry has not been as favorable as before. That is, increasing meeting space in a destination does not necessarily increase its opportunities to attract convention visitors and gain favorable economic impacts on the community (Dwyer, 2002; Nelson, 2004; Spiller, 2002; Weber & Chon, 2002). In other words, over-capacity has occurred with diminishing economic benefits for the MICE industry in the United States.

Over-Capacity in the MICE Industry

When investing in new convention centers or expansion of existing properties, lawmakers, government officials, and stakeholders tend optimistically to believe that the more convention space a city has, the more opportunities it will have to attract convention visitors and make favorable economic impacts on the community (Sanders, 2002). Sanders (2002) indicates that "the boom in convention center development has been sustained by persistent rhetoric from city to city: More space means more convention attendees, producing more spending, new jobs, and private development." In absence of accurate data on the MICE industry, destinations may underestimate or overestimate the demand for convention facilities (Dwyer, 2002; Nelson, 2004; Sanders, 2002). As a result, under-capacity or over-capacity may occur. When over-capacity occurs, the idle capacity costs are likely to make the industry unprofitable. On the other hand, under-capacity would imply opportunity loss for destinations (Gu, 2003). Astroff

and Abbey (2006) also point out that over-capacity of convention centers has forced some MICE centers to use cash or other incentives to book business. There are several examples in the MICE industry showing the current situation of over-capacity.

The Boston Convention and Exhibition Center, Boston

The Boston Convention and Exhibition Center, which contains 1,016,020 square feet, opened in 2004 at a cost of $850 million. The center was projected to have 537,600 new convention attendees, with a direct economic impact of $436 million, and an increase of 6,500 new jobs for the city and the commonwealth (City of Boston & Commonwealth of Massachusetts, 1997). However, according to the Massachusetts Convention Center Authority [MCCA] (2008), the Boston Convention and Exhibition Center hosted 125 events with a direct economic impact of $306 million. In an attempt to fill the new Boston Convention and Exhibition Center, Boston offered the MacWorld Expo free center rent, free use of city facilities, discounts on exhibitor services and transportation, and a guaranteed supply of reduced cost hotel rooms.

The Georgia World Congress Center, Atlanta

The Georgia World Congress Center expanded to 1.4 million square feet of exhibit space at $282 million in 2002. The convention attendance at the Georgia World Congress Center boomed through the 1990s, and reached a total of 837,752 attendees in 1997. However, the total attendance had dropped to 723,284 in fiscal 1999, 569,887 in 2002, 512,194 in 2003, and 396,517 in 2004. Although the expanded facility was expected to be a gold mine for the city's convention business, the city is now resorting to compensating some groups to rent its space (Astroff & Abbey, 2006; Sanders, 2005).

The Washington Convention Center, Washington, D.C.

Washington, D. C. replaced its old convention center with a new $834 million, 725,000 square feet facility in March 2003. In 2003, the new center hosted 324,000 convention attendees who used 315,307 hotel room nights. In comparison, the old convention center, with 380,000 square feet, hosted an average of 337,301 attendees and 337,640 room nights (Isler, 2008). After building an entirely new convention center with almost double the exhibit space, the Washington Convention Center Authority has not effectively increased attendance or hotel use (Isler, 2008).

Moreover, many of new convention-center hotels are publicly owned or heavily subsidized (Isler, 2008). In Texas, many hotels for convention centers have been approved with public help in Dallas, Houston, Austin, San Antonio, and Fort Worth. Chicago, Denver, Phoenix, St. Louis, and Baltimore also have owned convention hotels. One of the reasons that cities own or invest in convention hotels is that the elected city leaders believe that by building convention hotels, the cities can attract more visitors from outside the state. The taxes and economic activity generated by the visitors can make investments in hotels pay for themselves. However, the recent economic downturn is showing the fallacy of the belief.

A recent debate for the project of the convention hotel in Dallas, Texas, indicates the intensive capital investment issue. In 2009, the city of Dallas contracted a $500 million convention hotel with 1,016 rooms and 83,000 square feet meeting space that will be adjacent to the Dallas Convention Center and will be owned by the city itself. The hotel is believed to be the linchpin of Dallas' downtown economy. On the other hand, opponents of the convention hotel project questioned that while the city of Dallas is

running a $100 million deficit, it doesn't make sense to the city to invest in a convention hotel. Goodman (2009) suspects that, "If this was a good real estate transaction, the private sector would do it."

While convention planners admit they need massive hotels, private developers are less enthusiastic. The reason is that it takes too long for hotel profits to pay off the massive debt that comes from construction of the building with traditional private financing. Therefore, many cities offer non-traditional financing by subsidizing the hotels or issuing tax-exempt bonds to fund the hotels. The 1,100-room, $350 million Hyatt Regency Denver has been a success in helping the city accommodate big events and attract more convention visitors. On the other hand, the 1,100-room, $265 million Renaissance Grand and Suites Hotel in St. Louis has been a failure. It was not even able to pay off its debt. In 2009, the hotel went into foreclosure; its bondholders bought it at auction and kept it open (Goodman, 2009).

Capital Investment in the MICE Industry

The MICE industry is capital intensive. The Las Vegas Convention Center, for example, spent $195 million on 1.6 million square feet expansion in 2003 (LVCVA, 2009d). Further, the Las Vegas Convention and Visitor Authority Board approved the Master Plan Enhancement Program for the Las Vegas Convention Center with a budget of $890 million on its 86,616 square feet space expansion, which will be completed by the end of 2011(LVCVA, 2007c,d; LVCVA, 2008b). In the private sector, the Mandalay Bay Las Vegas invested $235 million on its 1.5 million square feet convention and exhibition space (LVCVA, 2009f). Outside Nevada, the Texas Irving Convention Center

invested $137 million on a new 275,000-square-foot convention center and entertainment complex, to open in December 2010 (Hultgren, 2009). The capital investments are enormous in the MICE industry. However, because of inaccurate data and over-optimistic feasibility studies, convention facilities are over-developed or under-developed, compared to the demand for the MICE industry. Therefore, it is crucial for practitioners to understand the financial performance and convention capacity utilization prior to investment decision making.

Capacity Management

Capacity management, one of the most important aspects of operating a business organization, refers to managing what an organization has and uses to perform work effectively and efficiently (Balachandran, Balakrishnan, & Sivaramakrishnan, 1997; Bish, Liu, & Suwandechochai, 2009; Gu, 2003; Yu-Lee, 2002). Yu-Lee (2002) explains that capacity management is important because it is a significant component of a firm's costs, represents a large amount of a firm's assets, and impacts a firm's ability to manage cash flow, the overall ability to operate and perform, and the organization's brand and brand image. Capacity can significantly influence the quality of products and services, and hence influence customer satisfaction.

The capacity of an organization indicates its ability to perform work. Capacity discloses itself in five ways including space, labor, equipment, technology, and materials (Yu-Lee, 2002). The total capacity of an organization is determined by how it combines and utilizes the capacity to perform work. For example, a firm combines people, equipment, and materials to make products in the manufactory industry. A service firm

combines people, space, and materials to provide services.

In summary, through managing capacity, a firm would control costs, assets, and cash flow, maximize efficiency and quality, and enhance customer satisfaction and its brand image. Eventually, profitability will be improved. Conversely, if capacity is not well managed, a firm's profitability will be decreased.

Space Capacity

Space capacity is the main focus of this research. Space capacity is the physical locations where a firm performs work (Yu-Lee, 2002, 2003). There are three types of measures for space capacity: area-time, operations-area, and area-product. Area-time measures focus on the amount of area needed over a given period of time. Operations-area measures help an organization understand how much space is required to perform tasks. Area-products help an organization understand the output of products and how much space is required to achieve this output. Organizations use these different types of measures for space capacity based on their operational objectives or financial objectives. For instance, the air cargo industry uses freight-tonne kilometers (FTK) to measure its freight capacity. The lodging industry uses room-night to measure its room capacity. The MICE industry uses square-foot-day to measure its convention space capacity (Convention Industry Council [CIC], 2010).

It is important for managers to know how to manage the space utilization effectively and efficiently over a period of time. From a financial perspective, area-time capacity has a growth element and a containment element (Yu-Lee, 2002, 2003). The growth element is to ensure that the desired levels of space will be available to support the expected growth of revenues. Thus, space capacity might be too much in the short term;

however, it might be necessary in the future. The containment element would focus on the minimum requirements necessary to meet demand. That is to minimize space expansion and maximize space utilization to meet the future demand. Since fixed costs of capacity are large, it is crucial for capital intensive industries, such as the airline industry, the lodging industry, and the MICE industry to balance space capacity with demand. Therefore, forecasting the demand for capacity and planning and responding to the expected demand are important in space capacity management. However, effective utilization of space capacity may or may not reduce costs, but may improve its financial performance because of the fixed costs of capacity (Yu-Lee, 2002, 2003).

When demand exceeds capacity, under-capacity occurs. The demand cannot be met because of the limited capacity. Therefore, the firm will lose certain amounts of sales revenue. In other words, the firm will have an opportunity loss. From an operation perspective, solutions include maximizing outputs and revenues subject to the constraints, increasing the relative capacity by outsourcing work to another organization, and increasing it by supplementing the capacity with other entities (Kotler, Bowen, & Makens, 2006). However, it is comparatively difficult for the capital-intensive service industry to increase its space capacity to meet demand in a short period of time (Gu, 2003). For instance, when hotel rooms are 100% occupied in a given period of time, the hotel cannot build extra rooms to meet additional demand in this short period of time.

Conversely, when capacity exceeds demand, over-capacity occurs. A part of capacity will be idle or wasted. The fixed costs of excess capacity will be added to existing production and profitability will inevitably decrease. Solutions to over-capacity include reducing existing capacity, seeking additional demand for the capacity, outsourcing the

capacity to meet extra demand, and moving or transferring the capacity (Kotler et al., 2006). Increasing utilization and adjusting the availability of the operation are also suggested (Kotler et al., 2006). However, increasing utilization or availability of operation may or may not reduce costs of capacity. For example, a resort hotel can create a low-price meeting package to attract the meetings segment during a slow season. This marketing strategy may just fill up empty rooms, restaurants, and meeting rooms, but may not reduce the fixed costs of the resort hotel. Therefore, over-capacity will likely cause cutthroat competition and declining profitability (Gu, 2003).

Capacity Management in the Service Industry

Capacity of the service industry is "the highest quantity of output possible in a given time period with a predefined level of staffing, facilities and equipment" (Lovelock, 1992). When service well matches demand and capacity, profitability is usually increased. However, due to the uncertainty of demand and perishability of capacity, service managers continue to struggle with the challenge of managing capacity and demand (Klassen & Rohleder, 2001). The perishability of capacity implies that there is a need for careful planning and management, as idle capacity and insufficient capacity can seriously affect the success of the service industry (Gu, 2003; Kotler et al., 2006).

Kotler et al. (2006) have found that every major sector of the hospitality industry has suffered from over-capacity mainly due to the following reasons: (1) owners are proud of having the largest capacity, (2) practitioners tend to believe that economies of scale will occur as size increases, (3) governments encourage investors to build a larger tourism or hospitality infrastructure to create economic growth, (4) feasibility studies and industry

forecast data are inaccurate or overly optimistic, (5) the hospitality and tourism industries believe that the future demand is almost unlimited, (6) the industry believes that a growing population, a breakdown of international barriers, and increasing disposable income will correct temporary over-capacity problems, (7) tax laws encourage investors to overbuild properties, and (8) the industry does not merge revenues management with sales and marketing management. In summary, limited accurate forecasts of tourism demand and sound feasibility studies often mislead government officials, stakeholders, investors, and practitioners to believe that the demand for the hospitality and tourism industries is unlimited and that the hospitality and tourism development generate a great economic impact on destinations and regions (Kotler et al., 2006). As a result, the hospitality and tourism industry has suffered from over-capacity.

Capacity management has been broadly studied in the manufactory industry (Balachandran et al., 1997; Bish et al., 2009), however, it is not widely studied in the hospitality and tourism industries. There are a couple of studies in the airline industry and the lodging industry (Kimes, 1989; Hellermann, 2006; Weatherford, Kimes, & Scott, 2001). The airline industry shares several common characteristics with the MICE industry. Both the airline industry and the MICE industry are capital intensive. Their operations are constrained by capacity. The airline's seat inventory and the convention space inventory are perishable. The demands for airlines and for conventions are fluctuating and seasonal. Moreover, their markets are highly competitive (Kimes, 1989). The airline industry has widely adapted yield management to help sell the inventory seats to the right type of guests at right time and for the right prices. Through yield management, the airline companies maximize utilization and maximize revenues with

capacity constraints. When capacity exceeds demand, the airlines use price discounts to increase capacity utilization. When demand exceeds capacity, they use reservations and price strategies to maximize revenues. However, according to Oum, Park, and Zhang (2000), recently, about 50% of the world fleet is operated under leasing rental agreement. Leasing offers airlines flexibility to use needed aircrafts without huge capital investment. Further, many international airline companies have joined airline alliances to coordinate their operations in providing international service. Brueckner (2001) indicates that the air fares in the interline city-pair markets are raised because of the loss of competition in that market. In addition to maximizing revenues and utilization, the complementary alliance helps airlines expand capacity with less fixed costs, and, therefore, maximize profit margins. Compared to the MICE industry, the airline industry has more flexibility in capacity management.

The lodging industry is similar to the MICE industry. They share the common characteristics of inseparability, perishability, and seasonability. Additionally, both of the lodging industry and the MICE industry are capital intensive. It is very crucial for hotel management to properly plan and manage capacity and demand because of these characteristics. It is very challenging to sell out the entire room inventory because of uncertain demand. Each unsold room night cannot be forwarded to the next day. The loss of revenue and the fixed costs of capacity will damage a hotel's profitability. Thus, many hotels have adopted yield management or revenue management in their operations in order to maximize revenues and utilization. There have been many studies on yield management in the lodging industry (Burgess & Bryant, 2001; Dunn & Brooks, 1990). Yield management helps managers to forecast demand, and then develop solutions to

maximize revenues and utilization for a comparatively short period of time (Kimes, 1989; Kotler et al., 2006; Weatherford et al., 2001). However, again, these solutions of maximizing revenues and utilization may or may not reduce fixed costs of capacity.

Undeniably, the MICE industry has been recognized as an important contributor to regional and national economies (Dwyer & Forsyth, 1996, 1997; Grado et al., 1998; Kim et al., 2003; Lee, 2006; WTO, 2006). However, because of the strong belief in the industry's great impact on local economies, government officials, investors, and practitioners tend to ignore the demand side and develop MICE facilities aggressively, consequently leading to over-capacity (Sanders, 2002). Especially during the current tough economic time with sluggish tourism and hospitality demand, the industry needs a sound development plan of its capacity based on accurate forecasts of demand and proper estimates of costs and benefits of the MICE facilities.

Inventory Management

Inventory management is one important aspect of operations management (Anderson, Sweeney, & Williams, 2010; Gu, 2003; Hellermann, 2006). Inventory serves as a buffer against uncertain and fluctuating usage and keeps a supply of items available for unexpected needs by the firm or its customers. However, the expense related to inventories is a large part of the costs. It is, thus, important for managers to make the best decisions on inventory management policy based on the cost of inventory systems (Anderson et al., 2010). To maintain an optimal inventory for operations, managers must know how to make decisions on how- much- to- order and when- to- order based on a scientific and systematic approach.

According to the demand patterns, Anderson et al. (2010) suggest several different models to solve the inventory problems, namely the economic order quantity (EOQ) model, economic production lot size model, inventory model with planned shortages, quantity discounts for the EOQ model, single-period inventory model, and periodic review model with probabilistic demand. The demand patterns are classified as deterministic and probabilistic. The EOQ model is applicable when the demand for the inventory item is relatively stable and occurs at a nearly constant rate. That is, the EOQ model is suitable when the demand is considered as deterministic or pre-determined (Gu, 2003). Conversely, the EOQ model would be inappropriate for the demand with wide fluctuations and uncertain demand rates. In hospitality and tourism operations, the demand for a destination is usually seasonal and uncertain. Thus, the EOQ model is not applicable to the MICE capacity management.

Single-Period Inventory Model

Anderson et al. (2010) indicate that the single-period inventory model is applicable to operations that involve seasonal or perishable products or services that cannot be carried in inventory and sold in future period; and the demand of seasonal or perishable products is uncertain, but with a probability distribution.

In the single period inventory model with probabilistic demand, incremental analysis is used to determine the optimal order quantity. There are two important variables in incremental analysis, the cost or loss of supplying one additional unit that is not demanded or the unit cost of oversupply (Co) and the opportunity cost of not supplying one additional unit that is demanded or the unit cost of undersupply (Cu). By comparing

the unit cost of oversupply with the unit cost of undersupply, the incremental analysis indicates that the optimal quantity of supply (Q*) is at the level when the expected loss (EL) of supplying one incremental unit is equal to the EL of not supplying one incremental unit, or EL(Q* + 1) = EL(Q*). Further, the expected loss of oversupply and undersupply can be defined as the probability of the ordering status multiplied by its unit cost (see Equation 1).

$$Co \times P(\text{demand} \leqq Q^*) = Cu \times [1 - P(\text{demand} \leqq Q^*)] \qquad \text{(Equation 1)}$$

The solution for P(demand $\leqq$Q*) can be defined as the cost of undersupply divided by the sum of the undersupply cost and the oversupply cost (see Equation 2).

$$P(\text{demand} \leqq Q^*) = Cu / (Cu + Co) \qquad \text{(Equation 2)}$$

In the single-period inventory model, the value of Cu / (Cu + Co) plays a critical role in selecting the order quantity. When Cu = Co, the optimal order quantity Q* should correspond to the median demand; when Cu > Co, a larger order quantity, which provides a lower probability of a stock-out in an attempt to avoid the more expensive cost of undersupply, will be recommended. Contrarily, when Cu < Co, a smaller order quantity, which provides a higher probability of a stock-out in an attempt to avoid the more expensive cost of oversupply, will be recommended. In summary, the single-period inventory model tends to warrant the ordering status with lower costs.

Hellermann (2006) used the single-period inventory model to develop the capacity-option pricing model, which estimates the optimal capacity and determines the best pricing and reservation policies for the air cargo industry. Gu (2003) applied the single-period inventory model to estimate the optimal room capacity for Las Vegas Strip casino hotels from 2001 to 2004. Based on annual number of room nights sold (dependent

variable) and time sequence (independent variable), the future annual demand of room capacity was estimated by using a trend regression analysis. Then, the estimated future annual demand was used by the single-period inventory model for estimating future optimal capacity.

To identify the optimal quantity of room nights available, which is optimal capacity or Q* for Las Vegas Strip casino hotels as defined in Equation 2, the cost ratio of Cu / (Cu + Co) was calculated. In this study, Cu is defined as income before corporate taxes per room night sold; and Co is defined as fixed cost per room night available because fixed cost occurs whether or not the room is sold. The cost ratio indicates the level at which the optimal capacity of room nights available or Q* should be within a normal probability distribution. Therefore, the Q* was derived by using the equation: Z score = $(Q^*-Y)/\sigma$, where Y represents the estimated future annual demand and σ represents the standard deviation of the demand. Both Y and σ were derived from the trend regression model.

The research indicates that the Las Vegas Strip casino hotels would experience over-capacity from 2001 to 2003, and under-capacity in 2004 and thereafter. Moreover, the research also points out that some intervening factors, such as 2001 economic recession, the September 11, 2001, terrorist attacks, and the Federal Reserve's interest rates policy, would impact the estimated optimal capacity. From a financial performance perspective, Gu (2003) defined the fixed cost per unit and the opportunity cost per unit and employed the single-period inventory model to develop the room capacity model. This capacity model reflects the bottom-line costs of an organization and helps managers to understand what the dynamics of costs are and how capacity impacts the cost dynamics, and then to

effectively and efficiently manage capacity.

There is a lack of literature on MICE financial performance and capacity analysis. A capacity optimization analysis of the MICE industry can help practitioners better understand the dynamics of the operational and fixed costs and the profitability of MICE operations, and then optimize the MICE capacity.

Application of the Single-Period Inventory Model to the MICE Industry

Similar to that of the hotels, the demand on the MICE industry is uncertain and highly seasonal and convention facilities, like hotel rooms, are perishable. The biannual Meetings and Convention report (Braley, 2008) and CEIR report (2009) point out that seasons, holidays, and weather conditions affect the MICE industry with the highest demand in October, March, and April, and the lowest in December and July in the U.S. Most companies and associations typically don't conduct meetings on certain holidays, such as Independence Day, Thanksgiving, Christmas, and New Year's. Severe weather conditions, such as hurricanes and snow storms, also affect the MICE industry in some destinations. Fluctuations in the economy and competition from rivaling destinations always cause market instability (Astroff & Abbey, 2006; Fenich, 2008; Isler, 2008).

In summary, the MICE industry has similar features of the hotel industry, namely perishable products and highly seasonal and uncertain demand. Therefore, the single-period inventory model should be appropriate for capacity management in the MICE industry.

Summary

In this chapter, the importance and the economic impact of the MICE industry were introduced. A review of the MICE facility development in Las Vegas and the U.S. indicated their current status of MICE capacity. The theories of capacity management and inventory management were introduced. The single-period inventory model was found to be appropriate for the MICE capacity optimization study. The methodology and data in applying the single-period inventory model are illustrated in Chapter 3.

CHAPTER 3

METHODOLOGY

The objectives of the research were to determine the current status of the MICE industry in terms of assets efficiency, operational costs, and profitability by evaluating financial performance and to project optimal MICE capacity by estimating future demand and analyzing capacity efficiency. This chapter contains two parts. First, derived from financial analysis, the assets efficiency, operational costs, and profitability were computed for the MICE industry. Second, the costs of under-capacity and over-capacity were estimated based on MICE industry financial data. Derived from trend regression analysis, the future demands were forecasted for the MICE capacity in Las Vegas and the U.S. Based on the estimated future demands and the estimated costs of under-capacity and over-capacity, this study was able to determine the optimal MICE capacity for the period from 2010 through 2014.

Financial Performance Analysis – Data and Analysis

This study used the overall revenue and expenses of the convention hotels in Las Vegas and the U.S. to assess the financial performance. Convention hotels earn profits through rental of meeting facilities and equipment and sales of service, accommodations, and food and beverage. Convention centers, which can only rent meeting facilities and equipment to customers, barely earn enough to pay for expenses. The mission of convention centers is to bring in convention visitors who will spend money on accommodations, food and beverage, transportation, sightseeing, shopping, and entertainment in host destinations. In return, convention centers collect room taxes as

indirect revenues from the local lodging operations (Fenich, 1998). Thus, the study only used the convention hotels' financial statements to evaluate the financial performance of the MICE industry.

With data of hotel operations from the Nevada Gaming Control Board, the study assessed the financial performance of the Las Vegas MICE industry. The financial performance of Las Vegas convention hotels was compared to that of U.S. convention hotels to identify the strengths and weaknesses of Las Vegas convention hotels. The financial performance analysis of the U.S. MICE industry was based on the U.S. convention hotels' financial reports from the *Trends in the Hotel Industry (USA edition)* by Pannell Kerr Forster [PKF] (2008, 2009, 2010). The study compared the financial performance of the U.S. convention hotels with all types of hotels in the U.S. to identify the strengths and weaknesses of the U.S. convention hotels. Financial ratios—namely operating efficiency ratio, earnings before interest, tax, depreciation, and amortization to total revenue (EBITDA/ total revenue), net operating income per available room, average daily room rate, occupancy rate, and room revenue per available room—were computed to analyze the financial performance.

U.S. hotels fall into the following categories: full-service, limited-service, resort, suite with food and beverage, suite without food and beverage, and convention hotels (PKF, 2009). According to PKF (2009), convention hotels provide facilities and services to meet the needs of corporate and association meetings and trade shows. These establishments, which typically have more than 500 guest rooms and substantial function and banquet space, include hotels attached to convention and conference centers. When PKF compiled the overall statistics of all U.S. hotels, convention hotels were kept at one

sixth or approximately 16.7% of all types of U.S. hotels. The financial statement analysis is shown by per available room (PAR) basis in order to ensure the comparability and accuracy across the six categories.

Time Series - Trend Regression Analysis

To anticipate the future and develop appropriate strategies are important management aspects for a firm to succeed in a long run. Scientific and systematic methods are recommended for management to accurately predict the future, although no single method can develop perfect forecasts (Makridakis & Taleb, 2009). Quantitative forecasting methods are suggested when (1) past information of the variable is available, (2) the information can be quantified, and (3) an assumption is that the pattern of the past will continue into the future (Anderson et al., 2010). Time series methods and causal methods are widely used for business forecasting.

A time series regression model uses a dependent variable related to time sequence to explore the patterns of historical data. Researchers use a time series regression model to identify patterns of movement in the past values of the dependent variable and extrapolate these patterns into the future (Dielman, 2005). When limited knowledge is available on the historical data of the variables, this regression approach is exceptionally applicable. Milas, Rothman, and Dijk (2006) argue that time series models are most often used for economic, business, and finance forecasting.

The assumption of a time series is that it consists of four separate components—trend, cyclical, seasonal, and irregular, which provide specific values for the time series (Anderson et al., 2010).

Each of the components of a time series has its characteristics and pattern. Trend components show gradual shifts or movements of a time series over a longer period of time. The gradual shifting of a time series is usually attributed to long-term factors such as changes in the population, demographic characteristics of the population, technology, and consumer preferences (Anderson et al., 2010). The trend in a time series could be described by some possible patterns, namely linear trend, nonlinear trend, and no trend. The cyclical component of a time series shows fluctuations, lasting over one year, around the trend line. Generally, the cyclical component of a time series is a cause of multiyear cyclical movements in the economy (Anderson et al., 2010). The seasonal component presents a regular pattern over one-year period in a time series (Anderson et al., 2010). Seasonality may repeat regularly over years. The irregular component of a time series is the residual factor. It accounts for the random variability caused by the short-term, unanticipated, and nonrecurring factors, such as nature disasters, terrorist attacks, and wars. The irregular component is unpredictable (Anderson et al., 2010)

MICE facility investments are usually determined on an annual basis. Although the demand for a MICE destination is uncertain and seasonal within one year, MICE facilities would take years to build. Thus, this study uses years as the trend component to forecast the future demand of MICE facility.

Regression analysis can be used to forecast future values of a time series when past values of the time series are available (Anderson et al., 2010). In this regression approach, the independent variable is time. The assumptions needed for regression analysis are (1) all of the observations must be independent, (2) for each value of the independent variable, the distribution of the values of the dependent variable must be

normal, (3) the variance of the distribution of the dependent variable must be the same for all values of the independent variable (Norusis, 2006).

For forecasting purposes, trend regression analysis is suggested to use historical data to identify patterns and extrapolate these patterns into the future (Dielman, 2005). Future MICE capacity demands for Las Vegas and the U.S. were, therefore, estimated by extrapolating a trend regression line with annual square foot days used as the dependent variable and time as the independent variable.

Annual number of conventions and exhibitions hold reported by the Las Vegas Convention and Visitor Authority (LVCVA, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007a, 2008a) and the annual average square foot days used reported by the Center for Exhibition Industry Research (CEIR, 2001, 2005) were used to estimate the trend regression model for predicting MICE capacity demand in Las Vegas. Annual square foot days used reported by Hospitality Valuation Services (HVS) (Detlefsen & Vetter, 2008) were used to estimate MICE capacity demand in the U.S.

The data were tested according to the assumptions of regression analysis. A Q-Q plot was used to examine the normality of the variables (Norusis, 2006). The variable points should cluster around a straight line if the variables are from a normal distribution. A scatterplot was used to investigate the relationship between the independent variable and the dependent variable. The pattern of scatterplot could be described as no relationship, positive linear relationship, negative linear relationship, or nonlinear relationship.

When the scatterplot of the variables indicates a curvilinear relationship between independent variable and dependent variable, the SPSS regression curve estimation procedure with 11 models could be utilized to identify the trend regression line that best

fits the data set (Chan & Lam, 2000; Gu, 2003; Milas et al., 2006). When employing a regression model in predicting future demand Y, the estimated Y is essentially the mean of future demand; the standard error of the predicted Y is the estimated standard deviation from the mean (Zikmund, 2003). Therefore, in this research, the regression model established can not only predict the mean of the future MICE demand, but also provides the probability distribution around the mean.

Capacity Optimization Analysis

The single-period inventory model proposed by Anderson, et al. (2010) is to deal with probabilistic demand by optimizing inventory level. The assumptions of this model are (1) the operation involves highly seasonal or perishable items, (2) the demand of the inventory item is uncertain, but has a probability distribution, and (3) only one order is placed for the item in a period and demand is probabilistic.

Considering the implication of the single-period room inventory model developed by Gu (2003) for Las Vegas casino hotels, this study developed a capacity model in terms of available convention space for the MICE industry in Las Vegas and the United States.

The unit cost of under-capacity, Cu is defined as the opportunity loss of not ordering one additional unit and later finding that it could have been sold if ordered (Anderson et al., 2010). Income before tax per square foot day sold, representing the forgone profits or unit opportunity loss, was used as a proxy for the cost of under-capacity. To derive income before tax per square foot day sold, aggregate income before tax for the MICE industry in 2008 was divided by total square foot days sold during the year. Using the most current MICE operating statistics of 2008, rather than an average of several

previous years, would provide conservative yet realistic estimates for the cost ratio of Cu/(Cu +Co) and the optimal capacity.

Anderson et al. (2010) define the unit cost of over-capacity, Co, as the loss of ordering one additional unit and later finding that it cannot be sold. In this study, the cost of over-capacity was defined as fixed cost per square foot day available because fixed cost occurs whether or not one square foot of convention space is sold. Fixed cost includes fixed charges, depreciation, amortization, property tax, and interests. The fixed component of mixed costs was separated from the variable one using the regression method as suggested by Schmidgall (2010). The fixed component of the year's mixed costs could be identified by subtracting the total variable cost, which is the variable cost per square foot day sold multiplied by the number of square foot days sold during a year, from the mixed costs of the year. The fixed cost per square foot day available can be obtained by adding the fixed component per square foot day available to the fixed charge per square foot day available.

The ratio of Cu/ (Cu +Co) in this study was the ratio of fixed cost per square foot day available to the sum of fixed cost per square foot day available and income before tax per square foot day sold. Since this research would estimate the optimal MICE capacity for Las Vegas and the U.S. from 2010 to 2014, the ratio estimated based on the operating statistics of 2008 should provide a fair approximation for the period from 2010 to 2014. Combining the derived cost ratio with future demand and probability distribution estimated from the regression model, the study was able to determine the optimal MICE

capacity Q* for Las Vegas and the U.S. for each from 2010 to 2014. Over-capacity and under-capacity can then be predicted by comparing Q* with the expected MICE capacity for 2010 to 2014.

Summary

The methodology and data collections were discussed in this chapter. Financial ratios were computed to analyze the financial performance. Trend regression analysis with the dependent variable of square foot days used was used to estimate the future demand of MICE capacity. Costs of under-capacity and over-capacity were defined. Applications of the single-period inventory model to project the optimal MICE capacity were discussed. The results will be presented in Chapter 4.

CHAPTER 4

FINDINGS OF THE STUDY

This chapter includes two sections: (1) financial performance and optimal capacity analysis for the Las Vegas MICE industry; and (2) financial performance and optimal capacity analysis for the U.S. MICE industry. Based on the availability of data, this study analyzed convention hotels' annual financial ratios to assess the financial performance of the MICE industry in Las Vegas and in the United States. This research used current operation statistics to investigate the costs of under-capacity and over-capacity and historic data to estimate the future demand, and then to predict the optimal MICE capacity for Las Vegas and the U.S., respectively.

Las Vegas MICE Industry

Financial Performance for the Las Vegas MICE Industry

The financial analysis of the Las Vegas convention hotels was based on *Nevada Gaming Abstract* by the Nevada Gaming Control Board (2007, 2008). The financial performance of the Las Vegas convention hotels was compared to that of the U.S. convention hotels to identify the strengths and weaknesses.

According to the *Nevada Gaming Abstract* (Nevada Gaming Control Board, 2008), sales revenue of Las Vegas convention hotels experienced a 0.74% decrease in total hotel revenues in 2008 (see Table 9). The average occupancy rate (OCC) of the convention hotels decreased 0.57% to 89.63%, but the average daily room rate (ADR) increased 1.93% to $125.25 in 2008. As a result, the room revenue per available room (RevPAR) increased 1.36% to $112.44. Meanwhile, U.S. convention hotels experienced a 6.76%

increase in total hotel revenues in 2008 (Table 10). Its OCC increased to 73.30% and ADR increased 5.35% to $186.43 in 2008. As a result, RevPAR increased 7.34% to $136.64. Overall, the U.S. convention hotels outperformed the Las Vegas convention hotels in terms of average daily room rate and revenue per available room (see Tables 9 and 10).

In 2008, an average U.S. convention hotel room produced $81,822 annually, which is the total annual hotel revenue, including revenues from rooms, food and beverage, and other operating departments, divided by total rooms available (Pannell Kerr Forster [PKF], 2009). An average Las Vegas hotel room made $190,667 (see Tables 9 and 10). It indicates that a Las Vegas convention hotel room made more revenue than an average U.S. convention hotel room. However, when assessing management's ability to generate sales and control expenses by comparing operating efficiency ratio (OER), which is gross operating profit divided by total revenue, the OER of the Las Vegas convention hotels (22.99%) was significantly lower than that of the U.S. convention hotels (33.22%). The reason was that Las Vegas convention hotels had high operating expenses.

Table 9

Las Vegas Convention Hotel Financial Performance Summary, 2007-2008

	2007	2008	Difference %
TTL Revenue Per Available Room	189,268.55	190,667.48	0.74
ADR	123.07	125.45	1.93
Occupancy Rate (%)	90.14	89.63	-0.57
RevPAR	110.93	112.44	1.36
Gross Operating Profits/ PAR	48,794.58	43,837.73	-10.16
Operating Efficiency Ratio (OER %)	25.78	22.99	-10.82
EBITDA / PAR	33,094.62	24,329.03	-26.49
EBITDA / Total Rev. (%)	23.79	20.50	-13.83
Net Income / PAR	17,960.33	5,582.86	-68.92
Net Income / Total Revenue (%)	9.49	2.93	-69.14

Table 10

U.S. Convention Hotel Financial Performance Summary, 2007-2008

	2007	2008	Difference %
Total Revenue Per Available Room	76,642.00	81,822.00	6.76
ADR	176.97	186.43	5.35
Occupancy Rate (%)	71.90	73.30	1.95
RevPAR	127.30	136.64	7.34
Gross Operating Profit / PAR	24,537.00	27,178.00	10.76
Operating Efficiency Ratio (OER %)	32.02	33.22	3.75
EBITDA / PAR	20,503.00	22,925.00	11.81
EBITDA / Total Revenue (%)	26.75	28.00	4.67

Departmental revenues for Las Vegas convention hotels in 2008.

For Las Vegas convention hotels, in 2008, room revenue increased 1.36% and food and beverage revenue increased 3.07% (Table 11). Besides the sale of food and beverages in restaurants, lounges, room service, mini-bars, and banquet rooms, food and beverage revenue of a convention hotel also includes revenue from meeting space rental,

convention service charges, and the rental of audio/visual and other meeting equipment. The increase of food and beverage revenue might imply that the revenue from convention service increased. The other operating department revenue of the Las Vegas convention hotels, such as telecommunications, Internet connections, guest laundry, retail shops, recreational facilities, and parking operations increased 6.4% (Table 11). Gaming revenue, which is the major revenue source of Las Vegas hotels, decreased 1.85% in 2008.

Departmental expenses for Las Vegas convention hotels in 2008.

The total departmental expenses increased 1.24% (see Table 11) from 2007 to 2008. While the departmental revenue of food and beverage and other operating department increased 3.07% and 6.40%, respectively, the departmental expenses decreased 0.46% and 2.92%, respectively. This might indicate that these two departmental expenses were well controlled while the departmental revenues increased.

While room revenue increased 1.36%, room expenses increased 6.42% in 2008. The percentage increase of the room expenses was more than the percentage increase of its revenue. This would imply that room expenses were not well controlled. The increase of bad debt and complimentary expenses (10.80%) and labor cost (9.08%) caused higher room expenses in 2008 (see Table 12).

Gaming revenue was 47.9% of the total hotel revenue in 2007 and 46.7% in 2008. The increase of bad debt and complimentary expenses (5.19%) and labor cost (2.76%) caused gaming department expenses to rise 2.18% in 2008. Particularly, because of the combination of the operations of casino and convention, Las Vegas hotels usually need to deal with bad debt and complimentary expenses (see Table 12).

Total undistributed operating expenses of the Las Vegas convention hotels increased 14.81% in 2008 (Tables 11 and 12). While administrative and general expenses grew 19.54%, bad debt and complimentary expenses decreased 65.15% and 3.45%, respectively (see Table 12). Overall, compared with a 0.74% increase in total revenue, the percentage increase of undistributed operating expenses was unacceptable.

Total fixed charges increased 24.07% in 2008 (Table 11). The increase was attributed to the increase of depreciation and amortization (20.67%), rental and lease (51.93%), interest expenses (26.91%), and property taxes (8.14%). Because most of the hotels in Las Vegas were comparatively new or recently renovated or expanded, the increase of fixed charges could be explained. Noticeably, high fixed charges would be critical to hotel financial performance, especially during an economic downturn.

In sum, while the total revenue increased 0.74%, total operating expenses increased 1.24% (see Table 11), undistributed operating expenses increased 14.81%, and fixed charges increased 24.07%. Thus, the Las Vegas convention hotels experienced a 68.92% decrease in income before tax in 2008.

Table 11

Las Vegas Operating Statement, Per Available Room, 2007-2008

	2007	2008	Difference	%
Revenues				
Gaming	$90,730.28	$89,048.15	-1,682.13	-1.85
Rooms	40,489.79	41,040.39	550.59	1.36
Food & Beverage	35,590.74	36,684.31	1,093.57	3.07
Other Operated Departments	22,457.74	23,894.64	1,436.90	6.40
Total Revenues	189,268.55	190,667.48	1,398.93	0.74
Departmental Expenses				
Gaming	47,015.60	48,042.71	1,027.11	2.18
Rooms	13,597.56	14,470.48	872.92	6.42
Food & Beverage	30,964.05	30,821.93	-142.12	-0.46
Other Operated Departments	14,904.91	14,469.47	-435.44	-2.92
Total Department Expenses	106,482.13	107,804.59	1,322.47	1.24
Total Department Income	82,786.43	82,862.89	76.46	0.09
Undistributed Operating Expenses				
Bad Debt	24.44	8.52	-15.92	-65.15
Complimentary Expenses	1,575.57	1,521.23	-54.34	-3.45
Administrative and General	25,428.53	30,396.35	4,967.83	19.54
Sales & Marketing	2,872.85	2,860.75	-12.11	-0.42
Property Operations and Maintenance	997.73	926.00	-71.73	-7.19
Utilities	3,092.73	3,312.31	219.58	7.10
Total Undistributed Operating Expenses	33,991.85	39,025.16	5,033.31	14.81
Income Before Fixed Charges	48,794.58	43,837.73	-4,956.84	-10.16
Fixed Charges				
Depreciation	13,586.10	16,393.93	2,807.83	20.67
Rental	1,548.20	2,352.25	804.05	51.93
Interest	13,482.30	17,110.56	3,628.26	26.91
Property taxes	2,217.66	2,398.14	180.48	8.14
Total Fixed Charges	30,834.25	38,254.88	7,420.62	24.07
Net Income	17,960.33	5,582.86	-12,377.47	-68.92

Table 12

Las Vegas Hotel Operating Expenses Analysis, Per Available Room, 2007-2008

	2007	2008	Difference	%
Gaming Department				
Total Labor Costs	13,885.72	14,269.58	383.86	2.76
Bad Debt & Complimentary Expense	16,460.39	17,314.65	854.26	5.19
Other Expenses	16,669.39	16,458.53	-210.86	-1.26
Total Department Expenses	47,015.50	48,042.76	1,027.27	2.18
Rooms Department				
Total Labor Costs	8,774.90	9,571.39	796.49	9.08
Bad Debt & Complimentary Expense	574.26	636.27	62.00	10.80
Other Expenses	4,248.37	4,262.84	14.47	0.34
Total Department Expenses	13,597.53	14,470.50	872.97	6.42
Food & Beverage Department				
Cost of Sales	10,675.32	10,571.71	-103.61	-0.97
Total Labor Costs	17,294.88	17,389.79	94.91	0.55
Bad Debt & Complimentary Expense	295.24	332.01	36.77	12.46
Other Expenses	2,698.54	2,528.45	-170.09	-6.30
Total Department Cost & Expenses	30,963.98	30,821.96	-142.01	-0.46
Other Operating Departments				
Cost of Sales	3,383.92	3,404.09	20.18	0.60
Total Labor Costs	5,010.79	4,951.58	-59.21	-1.18
Bad Debt & Complimentary Expense	407.84	369.61	-38.23	-9.37
Other Expenses	6,102.33	5,744.21	-358.12	-5.87
Total Department Expenses	14,904.88	14,469.49	-435.39	-2.92

Optimal Capacity Analysis for the Las Vegas MICE Industry

In 2008, the income before taxes per square foot day sold, or the costs of under-capacity (Cu), was calculated at $0.40, while the fixed charge per square foot day available, including depreciation, amortization, interests, rents, and property taxes, was estimated at $3.74. The fixed component of the mixed cost per square foot day available was found to be $1.24. Therefore, the fixed cost per square foot day available, or the cost of over-capacity (Co), was the sum of the two, or $4.98. The cost ratio of Cu/ (Cu + Co)

for the Las Vegas MICE industry in 2008 was thus estimated at 0.0743. The ratio means that the optimal capacity of square foot days available or Q* should be at the level where the probability for demand less than Q* should be 7.43% and the probability for demand exceed Q* should be 92.57%. In a standard normal distribution, Q* should be located at the left-hand side of the mean with a Z value of -1.45. Therefore, if the predicted mean demand Y and the standard deviation σ of the demand are known, the optimal capacity Q* can be estimated by solving the equation:

$$-1.45 = (Q^* - Y) / \sigma \qquad \text{(Equation 3)}$$

This study used 12 years' data derived from Las Vegas Marketing Bulletin (Las Vegas Convention and Visitors Authority [LVCVA], 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007a, 2008a) and Exhibition Industry Census I and II (Center for Exhibition Industry Research [CEIR], 2001, 2005) to forecast the future demand. Trend regression analysis was employed for this research. The dependent variable is square foot days used and the independent variable is time series-years. The historic data were tested for normality by using a Q–Q plot. This plot indicated that the variables were normally distributed. The scatterplot of the variables of a time series showed a nonlinear relationship. Thus, this study used 11 regression models to find the best fit model.

Table 13 shows the different regression curve estimates for predicting square foot days demanded for Las Vegas. Among the 11 regression models, the cubic curve regression model had the highest adjusted *R* square value, 0.78, but none of its predicting independent variables were significant ($p>0.05$) (see Table 14). The quadratic curve regression model had the next highest adjusted *R* square, 0.748 (see Table 13), and both its predicting variables were significant at the 0.05 level (see Table 15). Therefore, the

quadratic model was selected to forecast Las Vegas MICE demand for five years. The model can be written as: $Y = 297{,}300{,}000 + 322{,}400{,}000X - 12{,}950{,}000X^2$. The predicated mean square foot days demanded for 2010, or the 14^{th} year in the data series, was calculated at 2,272,700,000. Accordingly, the model predicted mean square foot days demanded at 2,219,550,000 in 2011; 2,140,500,000 in 2012; 2,035,550,000 in 2013; and 1,904,700,000 in 2014, respectively. The standard error of the Y estimate is 322,800,000 square foot days (see Table 15).

Table 13

Regression Curve Estimation for the Demand of the Las Vegas MICE Industry, 1997- 2008

Regression Method	R^2	Adjusted R^2	*F* Statistics	*Significance*
Linear	0.745	0.719	29.177	0.000
Logarithm	0.727	0.700	26.678	0.000
Inverse	0.502	0.452	10.074	0.010
Quadratic	0.794	0.748	17.340	0.001
Cubic	0.840	0.780	14.017	0.001
Compound	0.747	0.722	29.548	0.000
Power	0.754	0.729	30.589	0.000
S-Curve	0.535	0.488	11.494	0.007
Growth	0.747	0.722	29.548	0.000
Exponential	0.747	0.722	29.548	0.000
Logistic	0.747	0.722	29.548	0.000

Table 14

Cubic Regression Forecasting Model for the Las Vegas MICE Capacity

	Coefficient	*T* Stat.	*Significance*
Constant	878,900,000	1.781	0.113
X variable	-127,200,000	-0.403	0.697
X^2	70,140,000	1.269	0.240
X^3	-4,261,191	-1.521	0.167

Note. n=12, df=11, standard error of *Y*=301,600,000, model *F* stat.=14.017, *p*-value=0.001, adjusted R^2=0.78.

Table 15

Quadratic Regression Forecasting Model for the Las Vegas MICE Capacity

	Coefficient	*T* Stat.	*Significance*
Constant	297,300,000	0.891	0.396
X variable	322,400,000	2.732	0.023
X^2	-12,950,000	-1.466	0.017

Note. n=12, df=11, standard error of *Y*=322,800,000, model *F* stat.=17.340, *p*-value=0.001, adjusted R^2=0.748.

For 2010, the predicted mean demand was 2,272,700,000 square foot days with a standard error of 322,800,000 square foot days. Based on Equation 3, the optimal capacity for 2010 should be 1,804,640,000 square foot days. The optimal capacity for 2011-2014 was calculated in the same manner. Table 16 lists the model calculated optimal capacity in comparison to the expected available capacity for 2010-2014. The declining Q* or optimal capacity for the next five years is consistent with the declining Las Vegas MICE demand, measured by square foot days used, since 2006 as shown in Table 3. The expected square foot days available from 2010 through 2014 were derived based on the Hotel/Casino Development-Construction Report (LVCVA, 2010). The differences between the expected available capacity and the model determined optimal capacity representing the magnitude of over- or under-capacity point to over-capacity.

The over-capacity as a percentage of the optimal capacity is also indicated in the table. The difference in number of square feet for the year, which is square foot days divided by 365, is shown in the last column of the table.

The findings indicate that Las Vegas MICE industry has experienced and will continue to experience severe over-capacity. The Las Vegas MICE industry will experience at least 115% in excess of the optimal capacity for 2010-2014. The worst situation will be 181% over the optimal level in 2014.

Table 16

Las Vegas MICE Capacity 2010-2014: Optimal versus Expected

Year	Optimal Square Foot Days (Q*)	Expected Square Foot Days Available	Difference in Square Foot Days	Difference in %	Difference in Square Feet
2010	1,804,640,000	3,878,589,280	2,073,949,280	115	5,682,053
2011	1,751,490,000	3,881,509,280	2,130,019,280	122	5,835,669
2012	1,672,440,000	3,892,143,552	2,219,703,552	133	6,064,764
2013	1,567,490,000	3,881,509,280	2,314,019,280	148	6,339,779
2014	1,436,640,000	4,031,341,780	2,594,701,780	181	7,108,772

U.S. MICE Industry

Financial Performance for the U.S. MICE Industry

The financial analysis of the U.S. convention hotels was based on *The Trends in the Hotel Industry U.S.A.* by Pannell Kerr Forster (2007, 2008, 2009). The financial performance of the U.S. convention hotels was compared to all types of U.S. hotels to identify the strengths and weaknesses of U.S. convention hotels.

Financial Performance Analysis of U.S. Convention Hotels and All Types of U.S. Hotel, 2007-2008

According to the *Trends in the Hotel Industry* (PKF, 2009), sales revenue of U.S. convention hotels experienced a 6.76% growth in total hotel revenues in 2008 (see Table 10). The OCC for the U.S. convention hotels increased 1.95% to 73.30%, and the ADR increased 5.35% to $186.43 in 2008. As a result, the RevPAR increased 7.34% to $136.64. Conversely, all types of U.S. hotels experienced a 1.3% decrease in total hotel revenues in 2008 (Table 17). The OCC for all types of U.S. hotels decreased 1.82% to 70.00%, and the ADR increased 0.89% to $155.54 in 2008. As a result, the RevPAR decreased 0.95% to $108.88. Overall, U.S. convention hotels outperformed all types of U.S. hotels in terms of occupancy rate, average daily room rate, and revenue per available room (see Tables 10 & 17).

In 2008, a U.S. convention hotel room produced $81,822 annually, which is the total hotel revenue, including revenues from rooms, food and beverage, and other operating departments, divided by total rooms available, while an average U.S. hotel room made $59,645 (see Tables 10 & 17). This indicates that a U.S. convention hotel room made more revenue than an average U.S. hotel room. However, when comparing management's ability to generate sales and control expenses, the OER of the U.S. convention hotels (33.22%) was not significantly higher than that of all types of U.S. hotels (33.13%). The reason was that convention hotels had high operating expenses.

Table 17

All Types of U.S. Hotels Financial Performance Summary, 2007-2008

	2007	2008	Difference %
Total Revenue Per Available Room	60,433.00	59,645.00	-1.30
ADR	154.17	155.54	0.89
Occupancy Rate (%)	71.30	70.00	-1.82
RevPAR	109.92	108.88	-0.95
Gross Operating Profit / PAR	20,314.00	19,762.00	-2.72
Operating Efficiency Ratio (OER %)	33.61	33.13	-1.43
EBITDA / PAR	17,392.00	16,725.00	-3.84
EBITDA /Total Revenue (%)	28.78	28.00	-2.71

Departmental revenues for U.S. convention hotels in 2008.

In 2008, while room revenue increased 7.62% for convention hotels, food and beverage revenue decreased 2.5% (Table 18). Besides the sale of food and beverages in restaurants, lounges, room service, mini-bars, and banquet rooms, food and beverage revenue of a convention hotel also includes revenue from function room rental, meeting space rental, convention service charges, and the rental of audio/visual and other meeting equipment. The decrease of food and beverage revenue might imply that the revenue from convention services decreased. According to the 18th Annual Meetings Market Survey by the Professional Convention Management Association [PCMA](2009), the majority of meeting planners acknowledged that hotel room rates were rising and that, unable to handle rising room rates, planners were either limiting food and beverage functions, or relocating their events to secondary or tertiary markets in an effort to control their budgets. In 2008, the impact of meeting planner frugality on the sale of food and beverage was significant (PCMA, 2009).

The revenues from other operating departments of convention hotels, such as telecommunications, Internet connections, guest laundry, retail shops, recreational facilities, and parking operations increased 78.41% (Table 18). This significant increase was attributed to the increase of occupancy (PCMA, 2009; PKF, 2009). Moreover, revenues from rentals and other income, including revenues from rental of stores, cancellation and attrition penalties, and service concessions, increased 18.27% (Table 18).

Departmental expenses for U.S. convention hotels in 2008.

The total departmental expenses increased 4.42% (see Table 18) from 2007 to 2008. While the departmental revenue of rooms and other operated department increased, 7.62% and 78.41%, respectively, the room expenses and other operating expenses also increased 6.14% and 61.84%, respectively. The percentage increase of these two departmental expenses did not exceed the percentage increase of their individual departmental revenues. This might indicate that these two departmental expenses were well restrained while the departmental revenues increased.

On the other hand, while food and beverage revenue decreased 2.5%, the food and beverage expenses decreased 1.9%. The percentage decrease of the food and beverage expenses was less than the percentage decrease of its revenue. This would imply that food and beverage expenses were not well controlled. Further investigating food and beverage expenses (see Tables 19 and 20), salary and wages decreased only 0.16%, while employee benefits and related expenses increased 3.27%. Other food and beverage expenses, including cost of sales, decreased 7.34%. As a result, food and beverage income decreased 3.86% (Table 20). In comparison, these decreases can indicate that

convention hotel management made efforts on cutting costs of sales and related expenses. However, the increase in employee benefits compared to the overall loss of income revealed a warning sign of the labor costs of food and beverage operation. Convention hotel management should pay more attention to food and beverage departmental expenses, especially its employee benefits and related expenses of labor costs.

Total undistributed operating expenses increased 5.27% in 2008 (Tables 18). Sales and marketing expenses grew 6.03%. The other expenses of sales and marketing departments, including expenses of advertising, promotion, and franchise royalties and guest loyalty programs, increased 9.39% (see Table 19). Overall, compared with a 6.76% increase in total revenue, the percentage increase of undistributed operating expenses was acceptable. Further, management fees grew 10.77%, which can be explained by the incentive fee payments in 2008.

In general, since total revenue increased 6.76% and total operating expenses increased 4.72%, convention hotels experienced a 11.81% increase in earnings before interest, income tax, depreciation, and amortization (EBITDA) in 2008 (see Tables 18 and 19).

Table 18

U.S. Convention Hotels Operating Statement Summary, Per Available Room, 2007-2008,

	2007 $	2008 $	Difference $	Difference %
Revenues				
Rooms	46,469	50,009	3,540	7.62
Food & Beverage	25,690	25,047	-643	-2.50
Other Operated Departments	2,436	4,346	1,910	78.41
Rentals and other Income	2,047	2,421	374	18.27
Total Revenues	76,642	81,822	5,180	6.76
Departmental Expenses				
Rooms	12,727	13,509	782	6.14
Food & Beverage	17,924	17,581	-343	-1.91
Other Operated Departments	1,601	2,591	990	61.84
Total Department Expenses	32,253	33,680	1,427	4.42
Total Department Income	44,389	48,142	3,753	8.45
Undistributed Operating Expenses				
Administrative and General	6,103	6,427	324	5.31
Sales & Marketing	4,725	5,010	285	6.03
Property Operations and Maintenance	3,584	3,788	204	5.69
Utilities	2,841	2,939	98	3.45
Total Undistributed Operating Expenses	17,253	18,163	910	5.27
Gross Operating Profit	27,137	29,973	2,836	10.45
Management Fees	2,600	2,880	280	10.77
Income Before Fixed Charges	24,583	27,178	2,595	10.56
Fixed Charges				
Property and other Taxes	3,043	3,222	179	5.88
Insurance	990	1,031	41	4.14
Total Fixed Charges	4,033	4,253	220	5.45
Net Operating Income (EBITDA)	20,503	22,925	2,422	11.81

Table 19

U.S. Convention Hotel Operating Expenses Analysis, Per Available Room, 2007-2008

	2007 $	2008 $	Difference $	Difference %
Rooms Department				
Total Labor Costs	$7,999	$8,498	499	6.24
Other Expenses	4,728	5,012	284	6.01
Total Department Expenses	12,727	13,509	782	6.14
Food & Beverage Department				
Total Labor Costs	11,725	11,837	112	0.96
Other Expenses	6,199	5,744	-455	-7.34
Total Department Expenses	17,924	17,581	-343	-1.91
Other Operated Departments				
Total Labor Costs	887	1,224	337	37.99
Other expenses	714	1,366	652	91.32
Total Department Expenses	1,601	2,591	990	61.84
Administrative & General Department				
Total Labor Costs	3,024	2,931	-93	-3.08
Other Expenses	3,079	3,496	417	13.54
Total Department Expenses	6,103	6,427	324	5.31
Marketing Department				
Total Labor Costs	1,753	1,757	4	0.23
Other Expenses	2,972	3,251	279	9.39
Total Department Expenses	4,725	5,010	285	6.03
Maintenance Department				
Total Labor Costs	1,908	1,986	78	4.09
Other Expenses	1,676	1,801	125	7.46
Total Department Expenses	3,584	3,788	204	5.69
Utilities				
Expenses	2,841	2,939	98	3.45
Total Operating Expenses				
Total Labor Costs	27,296	28,234	938	3.44
Other Expenses	22,209	23,609	1,400	6.30
Total Operating Expenses	49,505	51,843	2,338	4.72

Table 20

Convention Hotel Food & Beverage Revenue and Expenses, Per Available Room, 2007-2008

	2007 $ per available room	2007 % of total department revenue	2008 $ per available room	2008 % of total department revenue	2007-2008 % Difference
Revenue	$25,690	100	$25,047	100	-2.50
Expenses					
Salaries, Wages and Bonuses	7,907	30.78	7,894	31.52	-0.16
Employee Benefits and related	3,818	14.86	3,943	15.74	3.27
Total Labor Costs	11,725	45.64	11,837	47.26	0.96
Other expenses	6,199	24.13	5,744	22.93	-7.34
Total Department Expenses	17,924	69.77	17,581	70.19	-1.91
Total Department Income	7,766	30,23	7,466	29.81	-3.86

Comparison analysis of U.S. convention hotels and all types of U.S. hotels.

In 2008, the labor costs and the other operating expenses of U.S. convention hotels were higher than that of all types of U.S. hotels, 43.69% and 27.89%, respectively (Table 21). The operating expenses per available room per year of convention hotels were $51,843, while the operating expenses per available room per year of all types of U.S. hotels were $38,108 (Table 21). The operating expenses of U.S. convention hotels were 36.04% higher than that of all types of U.S. hotels. Noticeably, the food and beverage's labor costs of U.S. convention hotels were 67.24% higher than of all types of U.S. hotels. The food and beverage department of a convention hotel covers a far wider range of services (including convention services) than that of a non-convention hotel and thus may incur much higher labor costs.

Table 21

Comparison Analysis of Operating Expenses, Per Available Room, 2008

Operating Expenses	Convention Hotels $	All U.S. Hotels $	Difference $	Difference %
Rooms Department				
Total Labor Costs	8,498	6,403	2,095	32.72
Other Expenses	5,012	3,813	1,199	31.45
Total Department Expenses	13,509	10,216	3,293	32.23
Food & Beverage Department				
Total Labor Costs	11,837	7,078	4,759	67.24
Other Expenses	5,744	4,075	1,669	40.96
Total Department Expenses	17,581	11,153	6,428	57.63
Other Operated Departments				
Total Labor Costs	1,224	871	353	40.53
Other Expenses	1,366	1,020	346	33.92
Total Department Expenses	2,591	1,891	700	37.02
Administrative & General Department				
Total Labor Costs	2,931	2,397	534	22.28
Other Expenses	3,496	2,605	891	34.20
Total Department Expenses	6,427	5,003	1,424	28.46
Marketing Department				
Total Labor Costs	1,757	1,458	299	20.51
Other Expenses	3,251	3,030	221	7.29
Total Department Expenses	5,010	4,487	523	11.66
Maintenance Department				
Total Labor Costs	1,986	1,441	545	37.82
Other Expenses	1,801	1,479	322	21.77
Total Department Expenses	3,788	2,920	868	29.73
Utilities				
Expenses	2,939	2,438	501	20.55
Total Operating Expenses				
Total Labor Costs	28,234	19,649	8,585	43.69
Other Expenses	23,609	18,460	5,149	27.89
Total Operating Expenses	51,843	38,108	13,735	36.04

U.S. convention hotels had higher OCC, ADR, and RevPAR than all types of U.S. hotels in 2008 (Tables 10 and 17). However, along with the higher business volumes in

terms of room sales and food and beverage sales, the total operating department expenses of U.S. convention hotels were also higher than that of all types of U.S. hotels. As a result, there was no difference in the EBITDA to total revenue (EBITDA/ Total Revenue ratio) between convention hotels and all types of U.S. hotels, both at 28%, in 2008 (Tables 10 and 17). This implies that higher operating expenses impacted on convention hotels' profitability.

Capacity Investment for Convention Facilities

Besides high operating expenses, convention hotels have very intensive capital investment (Woods, Nenemeier, Hayes, & Austin, 2007). Convention hotels have extensive meeting space that attracts meetings business. The construction or expansion of convention facilities usually takes enormous amounts of capital. The high costs of developing convention facilities result in higher depreciation costs and thus could affect profitability, especially when facing sluggish demand. Table 22 shows the revenues, operating expenses, and EBITDA of the Las Vegas Convention Center (LVCC) from 2000 to 2009. The EBITDA margin left for covering depreciation was limited. A significant increase in depreciation resulting from expansions during a slow economic time could easily make EBIT or net operating income of the LVCC negative. For example, the 1.6 million square feet Las Vegas Convention Center expansion in 2003 cost $195 million, or about $122 per square foot (LVCVA, 2009d). Its annual depreciation expense is $7.8 million for 25 years, based on the LVCVA's capital policy. The annual interest expense of its debts was approximately $6.1 million in 2008 (LVCVA, 2009c, d). Further, the Las Vegas Convention and Visitor Authority Board approved the Master Plan Enhancement Program (MPEP) for the Las Vegas Convention Center with a budget of

$890 million on its 86,616-square-feet convention space with 513,000 square feet support space expansion (LVCVA, 2008b). This enhancement program will cost approximately $1,484 per square foot. The main objective of the project is to renovate the existing facilities, such as public areas, restrooms, and support areas, in order to maintain its leading position in the U.S. MICE industry. This program will expand only 86,616 square feet to its meeting space, which would only generate limited operating revenue to the LVCC. Moreover, $822 million out of $899 million (91.43%) are financed by bonds issued by the LVCVA. The coverage of interest expenses provided by the EBIT would be meager or insufficient.

Table 22

Operating Revenue and Expenses of the Las Vegas Convention Center, 2000-2009

Year	Revenues	Operations Expenses	EBITDA
2000	$23,598,000	$21,350,000	$2,248,000
2001	27,698,000	23,777,000	3,921,000
2002	32,484,000	26,782,000	5,702,000
2003	34,645,000	27,626,000	7,019,000
2004	37,354,000	32,854,000	4,500,000
2005	45,056,000	34,824,000	10,232,000
2006	48,360,000	36,890,000	11,470,000
2007	50,619,000	41,270,000	9,349,000
2008	57,689,000	43,940,000	13,749,000
2009	46,504,000	37,350,000	9,154,000

Note. Annual depreciation was not included in the above operating expenses (nonrecurring expenditures).

The private sector of the Las Vegas MICE industry is also stepping up its expansion. The Mandalay Bay Hotel and Casino Las Vegas invested $235 million on its 1.5 million square feet convention and exhibition space, at an average cost of $157 per square foot

(LVCVA, 2009f). Outside Nevada, the Texas Irving Convention Center invested $137 million on a new 275,000 square feet convention center and entertainment complex, at an average cost of $498 per square foot, opened in December 2010 (Hultgren, 2009). Aggressive expansions of MICE capacity in the current economic situation can be highly risky, especially when projects are financed by debts.

Optimal Capacity Analysis for the U.S. MICE Industry

This study used 22 years of data from 1986 to 2007 derived from a Hospitality Valuation Service (HVS) report (Detlefsen & Vetter, 2008) to forecast the future demand. Trend regression analysis was employed for this research. The dependent variable is square foot days used and the independent variable is time series–year. The historic data were tested for normality by using a Q–Q plot. This plot indicates that the variables were normally distributed. The scatterplot of the variables of a time series showed a nonlinear relationship. Thus, this study used 11 regression models to find the best fit model.

In 2008, the income before taxes per square foot day sold, or the cost of under-capacity (Cu), was calculated at $0.22. Alternatively, the fixed charge per square foot day available, including depreciation, amortization, interests, rents, and property taxes, was estimated at $0.60. The fixed component of the mixed cost per square foot day available was found to be $1.44. Therefore, the fixed cost per square foot day available, or the cost of over-capacity (Co), was the sum of the two, or $2.04. The cost ratio of Cu/ (Cu + Co) for the U.S. MICE industry in 2008 was thus estimated at 0.0985. The ratio means that the optimal capacity of square foot days available or Q* should be at the level where the probability for demand less than Q* should be 9.85% and the probability for

demand more than Q* should be 90.15%. In a standard normal distribution, Q* should be located at the left-hand side of the mean with a Z value of -1.29. Therefore, if the predicted mean demand Y and the standard deviation σ of the demand are known, the optimal capacity Q* can be estimated by solving the equation:

$$-1.29 = (Q^* - Y) / \sigma \qquad \text{(Equation 4)}$$

Table 23 shows the different regression curve estimates for predicting square foot days in demand for the U.S. MICE industry. Among the 11 regression models, the cubic curve regression model had the highest adjusted *R* square value, 0.955, but none of its predicting independent variables were significant ($p>0.05$) (see Table 24). The quadratic curve regression model had the next highest adjusted *R* square, 0.939 (see Table 23), and both its predicting variables were significant at the 0.05 level (see Table 25). Therefore, the quadratic model was selected to forecast the U.S. MICE demand for the five years. The model can be written as: $Y = 2{,}349{,}000{,}000 + 212{,}500{,}000X - 3{,}761{,}000X^2$. The predicated mean square foot days in demand for 2010, or the 25^{th} year in the data series, was calculated at 5,310,875,000. Accordingly, the model predicts mean square foot days in demand at 5,331,564,000 in 2011; 5,344,731,000 in 2012; 5,350,376,000 in 2013; and 5,348,499,000 in 2014, respectively. The standard error of the Y estimate is 210,800,000 square foot days (see Table 25).

Table 23

Regression Curve Estimation for the Demand of the U.S. MICE Industry, 1986-2007

Regression Method	R^2	Adjusted R^2	*F* Statistics	*Significance*
Linear	0.919	0.915	226.002	0.000
Logarithm	0.862	0.855	125.176	0.000
Inverse	0.518	0.493	21.458	0.000
Quadratic	0.945	0.939	162.849	0.000
Cubic	0.962	0.955	150.730	0.000
Compound	0.913	0.908	208.587	0.000
Power	0.908	0.904	198.262	0.000
S-Curve	0.589	0.568	28.660	0.000
Growth	0.913	0.908	208.587	0.000
Exponential	0.913	0.908	208.587	0.000
Logistic	0.913	0.908	208.587	0.000

Table 24

Cubic Regression Forecasting Model for the U.S. MICE Capacity

	Coefficient	*T* Stat.	Significance
Constant	2,726,000,000.000	14.784	0.000
X variable	35,410,000.000	0.522	0.608
X^2	15,070,000.000	2.223	0.039
X^3	-545,853.087	-2.814	0.011

Note. n=22, df=21, standard error of *Y*=180,500,000, model *F* stat.=150.730, *P*-value<0.0005, adjusted R^2=0.955.

Table 25

Quadratic Regression Forecasting Model for the U.S. MICE Capacity

	Coefficient	*T* Stat.	Significance
Constant	2,349,000,000	15.865	0.000
X variable	212,500,000	7.167	0.000
X^2	-3,761,043	-3.004	0.007

Note. n=22, df=21, standard error of *Y*=210,800,000, model *F* stat.=162.849, *P*-value<0.0005, adjusted R^2=0.939.

For 2010, the predicted mean demand is 5,310,875,000 square foot days with a standard error of 210,800,000 square foot days. Based on Equation 4, the optimal capacity for 2010 should be 5,038,943,000 square foot days. The optimal capacity for 2011-2014 was calculated in the same manner. Table 26 lists the model calculated optimal capacity in comparison to the expected available capacity for 2010-2014. The declining Q* or optimal capacity for the next five years is consistent with the declining U.S. MICE demand, measured by square foot days used, since 2002 as shown in Table 8. The expected square foot days available from 2010 through 2014 were based on the studies by Detlefsen (2005), Hazinski and Detlefsen (2005), and Detlefsen and Vetter (2008). The differences between the expected available capacity and the model determined optimal capacity represent the magnitude of over- or under-capacity point to over-capacity. The over-capacity as a percentage of the optimal capacity is also indicated in the table. The difference in number of square feet for the year, which is square foot days divided by 365, is shown in the last column of the table.

Table 26

U.S.MICE Capacity 2010-2014: Optimal versus Expected

Year	Optimal Square foot days (Q*)	Expected Square foot days available	Difference in Square foot days	Difference in %	Difference in Square feet
2010	5,038,943,000	33,616,500,000	28,577,557,000	567	78,294,677
2011	5,059,632,000	34,419,500,000	29,359,868,000	580	80,437,995
2012	5,072,799,000	34,547,472,000	29,474,673,000	581	80,531,893
2013	5,078,444,000	35,018,100,000	29,939,656,000	590	82,026,455
2014	5,076,567,000	35,200,600,000	30,124,033,000	593	82,531,597

The findings indicate that U.S. MICE industry has experienced and will continue to

experience severe over-capacity. The U.S. MICE industry will experience at least 567% in excess of the optimal capacity for 2010-2014. The worst situation will be 593% over the optimal level in 2014.

Summary

This chapter presents the findings of the financial performance analyses for the MICE industry in Las Vegas and the United States. Using costs of under-capacity and over-capacity and forecasted future MICE demand, the study identified the optimal capacity for each year from 2010 through 2014. The results also show the magnitude of under- or over- capacity for the MICE industry in Las Vegas and the United States. Chapter 5 will discuss the findings and recommend solutions to the capacity problems.

CHAPTER 5

SUMMARY AND RECOMMENDATIONS

Since the meetings, incentive travel, conventions, and exhibitions industry (MICE) has significantly contributed to the tourism economy, industry practitioners, government officials, and stakeholders optimistically believe that investing in MICE facility development will bring in more convention visitors and make favorable economic contributions to the communities. The development of MICE facilities has been overwhelming in the U.S. Proper planning and management of capacity are important for the capital intensive service industry to meet demand and maximize profitability. This study analyzed the financial performance and projected the optimal capacity for the MICE industry in Las Vegas and the United States.

This chapter consists of: summary of the results, discussions of the findings, and recommendations to capacity problems. Limitations of the study and recommendations for future research are also identified.

Financial Performance of the MICE industry

Based on the financial performance analyses, high operating expenses and intensive capital investment are the two major challenges (disadvantages) for convention hotels. Convention hotels benefit from the big convention volume (advantage) in terms of creating revenue. Las Vegas convention hotels had higher revenue and ADR than U.S. convention hotels and U.S. hotels in 2008 (Table 27) because Las Vegas had been the top convention destination and held more of the top 200 events in the U.S. than any other destination (Fenich & Hashimoto, 2004). However, Las Vegas convention hotels had the

lowest operating efficiency ratio (OER) among the three categories of hotels. U.S. convention hotels had a similar OER with U.S. hotels. It implied that convention hotels had serious operating expense problems. Las Vegas convention hotels had profit margins of 9.49% in 2007 and 2.93% in 2008 (Table 9), indicating high fixed charges and operating expenses. Convention hotel management should take into serious consideration the impact of high operating expenses and intensive capital investment on profitability and the default risk of debts used for expansions.

Table 27

Financial Performance Analysis Summary, 2008

	Las Vegas Convention	U.S. Convention	U.S. Hotel
Total Revenue Per Available Room	190,667.48	81,822.00	59,645.00
ADR	125.45	186.43	155.54
Occupancy Rate (%)	89.63	73.30	70.00
RevPAR	112.44	136.64	108.88
Gross Operating Profit / PAR	43,837.73	27,178.00	19,762.00
Operating Efficiency Ratio (OER %)	22.99	33.22	33.13
EBITDA / PAR	24329.03	22,925.00	16,725.00
EBITDA / Total Revenue (%)	20.50	28.00	28.00

Policy recommendations for the industry regarding its current operations and future growth are provided as follows.

Policy Recommendations for Operations

Convention hotel managers should pay more attention to controlling operating expenses, especially the labor costs of food and beverage departments. There are several policy recommendations:

- Staffing in food and beverage department should be more elastic to the operation needs by maintaining minimal full-time workers and hiring more hourly workers. This allows managers to have more flexibility and adjust hourly workers based on operation needs.
- Outsourcing non-core operations is another solution to reduce labor costs. In the long term, convention hotels could save not only on salary and wages, but also on employee benefits, insurance, and pensions. The operations of stewarding, kitchen cleaning, restaurant linen cleaning, florist shops, banquet artists, and meeting AV technicians could be outsourced.
- Effectively managing the number of full-time workers can help convention hotels reduce employee benefits and related expenses. Full-time workers are usually entitled benefits and insurance, which contributes to a large part of labor cost.
- Employee benefit policy should be reviewed and revised based on current economy. Alternative benefit and insurance policies with lower expenses should be considered.
- Further, effectively scheduling necessary employees for operation is important to improve operation efficiency. Convention managers could schedule employees working on different shifts to complete functions.

In order to increase the profitability of convention hotels, managements should avoid over-discounting, especially for convention services. Convention hotels usually give discounts to meeting clients, especially in a stiff competitive market. Considering high operating expenses of food and beverage operations, managers should set and retain a minimal requirement for departmental profit margin. When accommodating meeting

events, convention hotel managers can ask meeting planners to meet a minimal food and beverage consumption requirement to guarantee food and beverage revenues and retain departmental profit margin.

Convention hotel managers should carefully plan their food and beverage pricing strategy because high pricing will scare away meeting planners and convention groups (Fenich, 2008). For example, when hotel room rates are high, meeting planners will reduce food and beverage consumptions or move meetings to second- or third-tier cities to control their meeting budgets. Creating meeting packages is one of the solutions to attract meeting planners and convention groups. Based on cost analysis, meeting packages could be developed to cover high operating expenses and maximize profit margin.

Policy Recommendations for Growth

Based on the analysis of new investments for convention facilities, the construction or expansion of convention facilities usually takes an enormous amount of capital. The high costs of developing convention facilities resulted in higher depreciation costs and interest expenses and thus could affect profitability, especially when facing sluggish demand. When demand is slow, a convention hotel will have limited EBITDA and even negative net income. When investment projects are financed by debts, aggressive expansions of MICE facilities can be highly risky in terms of its interest coverage ability during the economic downturn. Therefore, for the industry, future growth based on a MICE capacity optimization analysis is necessary. Guiding the industry's growth to optimize its future capacity based on scientifically projected demand, costs, and benefits should help the

industry avoid or minimize over-capacity, operation losses, and the risk associated with debt financing.

Capacity Analysis for the MICE Industry

In this study, while the unit oversupply cost, Co, was found to be $4.98 and the unit undersupply cost, Cu, only $0.40, or 8% of Co for the Las Vegas MICE industry, the unit oversupply cost, Co, was found to be $2.04 and the unit undersupply cost, Cu, only $0.22 for the U.S. MICE industry (Table 28). The tremendous gap between the two costs suggests that the cost of providing one additional square foot day of MICE space has far exceeded the benefit associated with one additional square foot day sold or the unit opportunity cost. Indeed, both Las Vegas and the U.S. are in a highly saturated market and the destinations are facing a very serious over-capacity situation in their MICE industry (Detlefsen & Vetter, 2008). The tiny Cu/(Cu + Co) cost ratios, at 0.0743 and 0.0985 respectively, show that given present market conditions, much greater chance should be given to under-capacity rather than over-capacity because of the highly imbalanced costs ratios.

Table 28

Cost Ratios Summary

	Under-capacity Cost (Cu)	Over-capacity Cost (Co)	Cost Ratio Cu / (Cu + Co)
Las Vegas	0.40	4.98	0.0743
U. S.	0.22	2.04	0.0985

The severe over-capacity of the MICE industry identified in this study is likely the

result of a belief in “Build it and they will come” in the industry (Sanders, 2002). In Las Vegas, from 1997 to 2008, many new MICE facilities, such as the Las Vegas Convention Center, Mandalay Bay, Venetian, Bellagio, and Palazzo were built and launched into operation. These convention facilities added 5.7 million square feet to the existing capacity and have significantly contributed to the city’s MICE over-capacity. On the other hand, in the U.S. approximately 24.3 million square feet were added to the existing MICE facilities from 1997 to 2008 (see Table 4). Besides current ongoing projects of 4.34 million square feet, *Tradeshow Week* (2010) points out that another 3.2 million square feet will be added to the U.S. MICE industry after 2014. The aggressive growth has worsened over-capacity of the MICE industry.

The tiny Cu/(Cu+Co) ratio of the MICE industry is also a reflection of intensified competition among the U.S. destinations and within the Las Vegas destination. Aggressive MICE expansions nationwide have led to not only fierce competition between Las Vegas and other MICE destinations, like Orlando and Chicago, but also cutthroat competitions within Las Vegas itself (Wimberly, 2009). To win MICE clients, providers have to lower service prices to beat the competitors. This has inevitably cut into profit margin and lowered income before taxes from the MICE operations and thus the much lower cost of undersupply, Cu.

Table 3 shows a steady declining trend of square foot days used from 2006 to 2008 in Las Vegas. In 2009, Las Vegas had more than 400 event cancellations and experienced a 13.6% decrease in the number of conventions and exhibitions, and a 24% decline in convention attendance (Wimberly, 2009; Las Vegas Convention and Visitors Authority [LVCVA], 2010). Shrinking convention budgets have led to declining convention sizes in

recent years. Las Vegas has been struggling with low utilization of square footage and decreased MICE revenue due to the economic recession (Wimberly, 2009). However, according to the Hotel /Casino Development-Construction Bulletin, as of September 1, 2010 (LVCVA, 2010), while the reality points to stagnant or declining demand, many hotels and resorts, including the Wingate by Wyndham, with 4,000 square feet to be completed in 2011; the Hilton Branded Property, with 4,000 square feet to be completed in 2011; the Harmon Hotel and Spa (City Center) Las Vegas, with 17,500 square feet to be completed after 2012; and the Fontainebleau Las Vegas, with 393,000 square feet to be completed after 2012, are planning to expand their convention facilities with a total of 418,500 square feet in next five years. Given the torpid demand and the aggressive expansion plan of the MICE industry, this study found that in Las Vegas, planned available capacity will be at least 115% in excess of the optimal capacity for 2010-2014 (see Table 29). The most severe over-capacity will occur in 2014, when the planned capacity will be 181% more than the optimal level.

The U.S. MICE industry has encountered low utilization and massive expansion since 1986 as well (Table 8). The *CEIR* Index report by the Center for Exhibition Industry Research (CEIR) (2009) also reveals an overall 12.5% decline in the U.S. convention industry in 2009. The industry experienced a 12.3% decline of total square feet used and a 13.2% decrease of total revenue in 2009. However, capital investments of new convention facilities and expansions of existing buildings have been continuously increasing. Expected capacity in the U.S. will be approximately 593% over the optimal level in 2014 (Table 30). Nevertheless, several projects of 3.2 million square feet will be added to the U.S. MICE industry after 2014, including San Diego Convention Center,

Prairie Capital Convention Center in Illinois, Jeffersonville Convention Center in Indiana, and Boston Convention and Exhibition Center (*Tradeshow Week*, 2010). The wisdom of making those plans for capacity expansions is highly questionable.

Table 29

Summary of Optimal Capacity vs. Expected Capacity for Las Vegas, 2010-2014

Year	Optimal Square feet	Expected Square feet	Difference in Square feet	Difference in %
2010	4,944,219	10,626,272	5,682,053	115
2011	4,798,603	10,634,272	5,835,669	122
2012	4,569,508	10,634,272	6,064,764	133
2013	4,294,493	10,634,272	6,339,779	148
2014	3,936,000	11,044,772	7,108,772	181

Table 30

Summary of Optimal Capacity vs. Expected Capacity for the U.S., 2010-2014

Year	Optimal Square feet	Expected Square feet	Difference in Square feet	Difference in %
2010	13,805,323	92,100,000	78,294,677	567
2011	13,862,005	94,300,000	80,437,995	580
2012	13,860,107	94,392,000	80,531,893	581
2013	13,913,545	95,940,000	82,026,455	590
2014	13,908,403	96,440,000	82,531,597	593

Detlefsen and Vetter (2008) argue that MICE facilities have competed for limited business. Hughes (2010) also points out that major hotels have progressively invested in properties with quality convention spaces and this has raised the standard for the industry, making it more competitive. Only those convention centers and hotels with the best competitive advantage will succeed. If convention centers or hotels do not have

competitive strengths with respect to location, transportation infrastructure, amenities, price, technology, marketing, and management, then they are likely to fail in terms of their financial performance and their ability to generate economic impacts for a community (Hughes, 2010).

Summary and Recommendations

Using the demand trend and aggregate operation statistics of convention hotels and convention centers, this study developed an inventory model to estimate the optimal MICE capacity for Las Vegas and the U.S. in the years to come and measured the magnitude of over-capacity from 2010 through 2014. The findings indicate that both Las Vegas and the U.S. have experienced and will continue to experience severe over-capacity, and the worst situation will occur in 2014. Based on the findings, this study proposes the following recommendations for the MICE industry to cope with the over-capacity.

First of all, the industry must reevaluate its expansion plans for the next five years. Any expansion plan should be based on a sound analysis of financial costs and benefits and the future demand. The fallacy of "Build it and they will come" should no longer prevail for the MICE industry in Las Vegas and the United States. Industry executives and government officials should go back and weigh the market conditions and the costs involved in MICE capacity development and operation and revise their plans carefully and scientifically.

Secondly, given the tremendous cost of oversupply and the trivial opportunity cost of undersupply and the sluggish future demand, it's high time for the industry to put a brake

on aggressive MICE facility expansions. Blindly expanding the facilities disregarding the costs involved and the demand reality will put further financial burdens on firms in the MICE industry, inevitably leading to more business failures and bankruptcies.

Finally, raising the utilization rate of the existing MICE facilities is the key for coping with the current MICE over-capacity. Both the industry and Destination Marketing Organizations (DMO) should aggressively promote Las Vegas and the United States as MICE destinations to gain market shares nationally and internationally. It is necessary to raise the MICE utilization rate to over 70% or the industry standard booking rate (CEIR, 2009; LVCVA, 2009d). Since the MICE industry has competed for limited business, convention centers or hotels need to enhance their competitiveness to succeed. While competing for business, MICE operators should avoid any cutthroat price competition. Instead, to bolster demand for these convention facilities,, industry operators could seek additional demand for the capacity or outsource the capacity to meet extra demand. For instance, industry executives could lease these idle convention facilities as business offices, long-term showrooms, or training venues.

Promoting Las Vegas and the United States for international events is a good way to raise the facility utilization and revenue. According to the Las Vegas Visitor Profile: Market Segment Version (LVCVA, 2009a), only 8% of the total convention visitors were from outside the U.S. in 2008. The visitor profile also indicates that international convention visitors usually stay longer and spend more than other visitors, thus financially contributing more to the industry (LVCVA, 2009a). While making efforts to get more regional and national conventions, the DMO should help the MICE industry more aggressively expand convention and exhibition businesses internationally,

especially in Asia Pacific countries. However, U.S. visa requirements have been recognized as a barrier blocking international convention events and visitors to the United States. According to a recent study by CEIR (2011), without U.S. visa barriers, hotels would receive additional sales of $295 million and restaurants would gain extra sales of $60 million in international visitor spending in 2010. Therefore, the U.S. government should consider the economic contributions of international convention visitors and loosen the visa policy for those visitors to enter the U.S.

Significant Contributions of the Study

This study evaluated the MICE industry's financial performance from the industry operator/owner's perspective. The findings of financial performance show that MICE operations had higher operating expenses, interest expenses, and intensive capital investments which would impact their profitability and have high risk in debt financing. Through the findings, industry executives and government officials could better understand the current status of the industry in terms of assets efficiency, operating costs, and profitability.

Using the demand trend and aggregate operation statistics of convention hotels and convention centers, this study developed an inventory model to estimate the optimal MICE capacity for Las Vegas and the U.S. in the years to come and measured the magnitude of over-capacity from 2010 through 2014. The cost ratio analysis indicates that over-capacity cost was much greater than under-capacity cost. The results of the capacity optimization analysis conclude that both Las Vegas and the United States will continuously encounter severe over-capacity from 2010 to 2014. This study also offers

the MICE industry several solutions to the over-capacity problems.

Academically, this study would make a good contribution to capacity optimization literature by applying a theoretic model to the MICE industry.

Limitations

A major limitation of this study is that the cost estimates and demand projections were based on the operation statistics up to 2008, the most recent year with available data when this study was conducted. Since the MICE industry experienced further decrease in terms of number of conventions and exhibitions and revenues in 2009 (Wimberly, 2009; LVCVA, 2010), the downward trend of the demand could be even worse if the 2009 statistics are incorporated in the analysis. Therefore, the conclusions based on the findings in this study only represent a very conservative estimate of the future MICE over-capacity in Las Vegas and the U.S. In the optimal MICE capacity analysis, the forecast of the first three years would be more accurate than the last two years.

The analysis provided in this study is from the perspective of owner/operator of the MICE industry. It only included direct spending of convention visitors contributing to the convention centers and convention hotels. The economic contributions of the MICE industry were not included in this study.

Recommendations for Future Research

A new study that includes the 2009 data may provide a more accurate assessment of the over-capacity that Las Vegas and the U.S. will face in the years to come. During the current tough economy, the declining demand and revenue would have a significant

impact on the estimate of optimal MICE capacity for Las Vegas and the United States.

This study is from the perspective of owner/operator of the MICE industry. Future research may broaden the scope to view the MICE capacity optimization from the local economy perspective and include the multiplier effect of the MICE industry in the analysis. Economic benefits derived from indirect spending may be also considered in planning the optimal MICE capacity. The multiplier effect would result in higher economic benefits and, thus, a higher under-capacity cost or opportunity loss. An analysis including multiplier effect would give a different result of the optimal capacity analysis. The cost ratio would lead to a larger optimal capacity and smaller over-capacity problem.

This inventory model can be applied to estimate optimal capacity for MICE destinations in other regions. Every MICE destination has its own strengths and weaknesses, such as location, transportation infrastructure, and attractions, which affect its market demand. Besides the demand, each MICE destination would have different operating cost structures and capital investment expenses and, as a result, have different cost ratio and optimal capacity. For instance, while Chicago has high labor costs and capital cost, Orlando may have comparatively low labor cost and capital cost. These differences in costs would affect cost ratios, which determine the optimal order quantity.

Future research could apply this model to tourism developments or public investment projects, such as theme parks, recreation centers, sport stadium, and arenas. A capacity optimization analysis based on a financial benefits and costs analysis should be able to provide a more accurate and reliable feasibility analysis for investors and government officials.

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