Gaming Industry: Best Practices for Data Analytics to Enhance Decision Making

Prepared By:

GGH - Morowitz Gaming Advisors, LLC & Global Gaming & Hospitality, LLC

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INTRODUCTION

The availability of data has revolutionized the business world. From manufacturing to services, the ability to mine, manipulate and understand data can not only provide a competitive advantage but its effective utilization can also be the difference between business success and failure. This is certainly true for the gaming industry, which is awash in data and in which increased competition, high taxes and high capital requirements have squeezed excess margins and returns to virtually zero in some instances.

Global Gaming & Hospitality and Morowitz Gaming Advisors ("GGH") acknowledge this trend and are committed to providing gaming operators and investors with analytics and research that can help them optimize the financial performance of their gaming operations and investments. In that regard, we have undertaken a project to codify our observations while analyzing gaming operations throughout the U.S., to provide our perspectives regarding ongoing trends and best practices in the management of casino operations. This is the second of a series of White Papers that are devoted to informing gaming operators of the results of our analyses as well as providing actionable recommendations to enhance operating performance.

Data analytics and management have become important buzzwords for the gaming industry. The discussion and analysis that follows focuses on a best practices approach to data management applied to gaming. Members of the GGH team will be happy to discuss data analytics with your organization to determine how we might enhance your strategic capabilities in this regard. Cory Morowitz is the author of this White Paper and can be contacted at cory@morowitzgaming.com.

BEST PRACTICES APPLIED TO DATA MANAGEMENT IN A GAMING ENVIRONMENT

When I think about baseball - Batting Averages, Home Runs and Runs Batted In come to mind. Baseball players have traditionally been judged on these statistics. The book "Money Ball" challenged existing beliefs and the WAR (Wins Above Replacement) statistic is suddenly all the rage. This statistic seeks to answer the question of how much more valuable a player is than his typical replacement. This is a new way of looking at data that has been available since the first box score was published and has revolutionized the management of the sports industry. In gaming, statistics like win per unit, occupancy and ADR are like Batting Average and Runs Batted In - mainstays to measure performance. Perhaps it's time for the gaming industry to adopt a *Money Ball* approach and revolutionize the way it looks at data as well.

From sports, to casinos, to manufacturing and to other industries, big data and predictive analytics have become the rage. More points of customer and employee contact are linked electronically, and thus there is almost no statistic that is not captured. With all this data available now, the key is to make it presentable, easily understood and actionable so that businesses can make better decisions to optimize performance.

The typical casino generates hundreds of thousands to millions of small transactions daily from gaming, food and beverage, hotel, retail and other operations. Managing this flow of data and creating actionable decisions on a timely basis can be the difference between an outperforming and underperforming casino. In this White Paper, GGH provides a simplified review of data analysis that can be applied to any gaming environment.

The first step in any data rich environment is to understand the data availability within the casino and establish appropriate benchmarks with which to measure operational performance. By comparing data analytics to proper benchmarks, casinos can create goals and objectives for managing operations. Benchmarks include historical best practices, market competitor performance benchmarks as available, industry benchmarks, and publicly held company benchmarks, among others. Once these benchmarks are identified, best practice analytics should be applied to the data so that an improvement plan can be implemented and its effectiveness monitored. Sophisticated analytical techniques should be utilized and, ideally, an easy to use dashboard and reports should be created so that the resulting information is actionable.

Predictive analytics can be applied to everything from checking the efficacy of a free play program to forecasting labor needs on a Friday afternoon. Lastly, a proper evaluation system should be implemented to measure actual outcomes against predictions, decisions and performance. This allows for an iterative learning environment in which operational performance goals are created, performance is analyzed, decisions are optimized, predictions made, outcomes are evaluated, and changes are implemented as necessary. The process repeats itself until operating performance is improved and optimized. This process is summarized in the following graphic.

Data Analytics Process

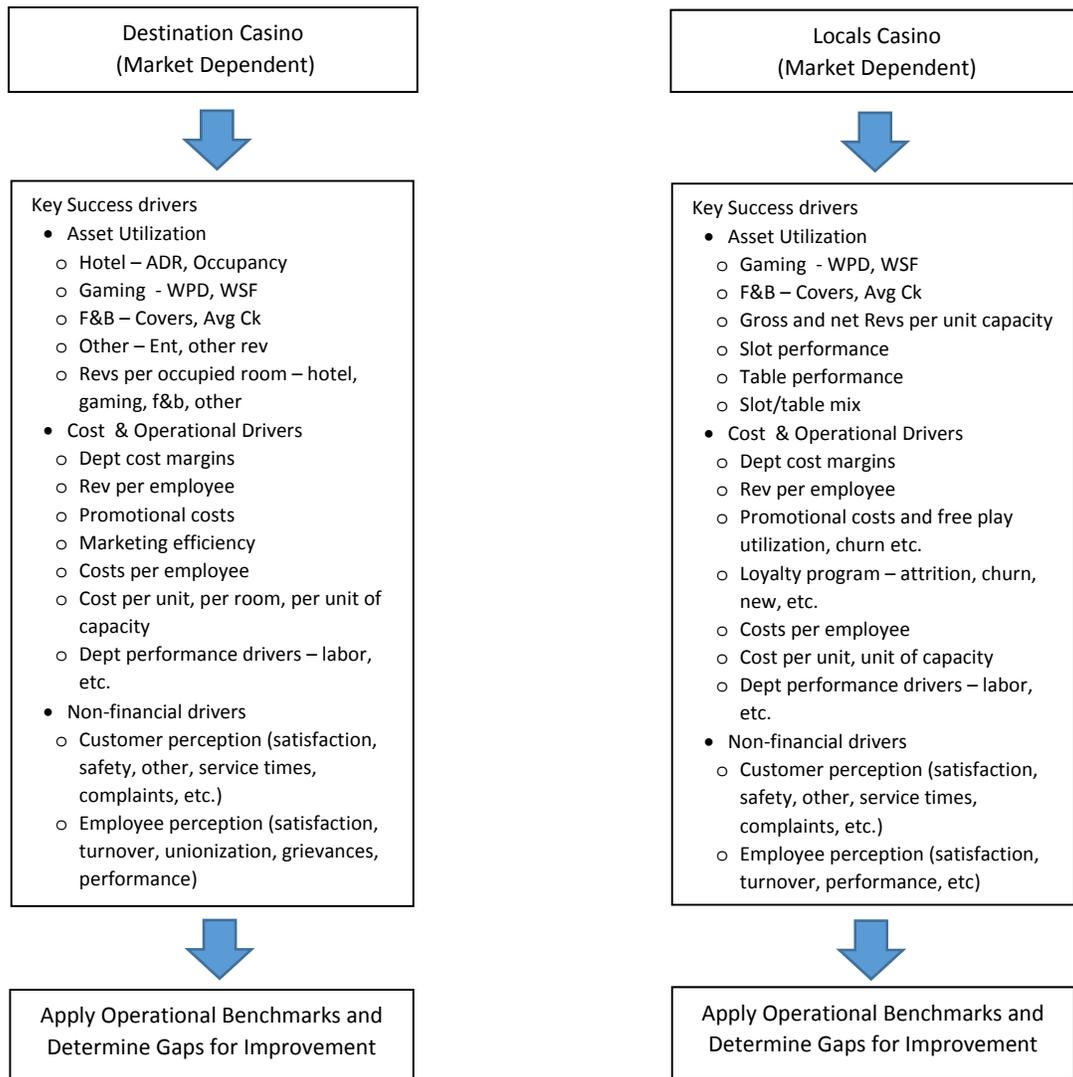Benchmark → Analyze → Predict → Evaluate → Implement Change as Necessary
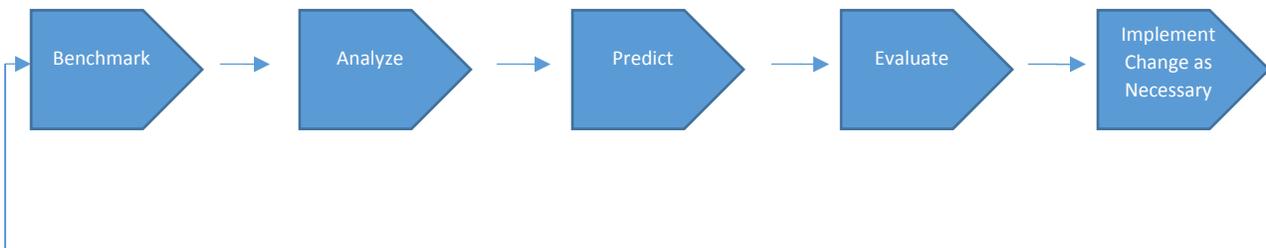
BENCHMARKING

Benchmarking of data starts with determining the data that is available to be analyzed. A casino's market location, positioning within the market, asset base and strategic focus are the starting point for establishing benchmarks from which an operation can measure its progress in attaining its objectives. A destination casino in Nevada will have very different benchmarking needs than a high frequency locals' oriented casino in the northeast. The destination casino will need to measure the usual factors like room occupancy, ADR, daily win per unit, restaurant covers, etc. Competitive benchmarks for these factors are obtainable through public sources like the Nevada Gaming Abstract or through company filings and earnings releases. Benchmarks can be further developed for data such as revenue per occupied room, cost per occupied room, etc.

In the locals environment, benchmarks and data involving gaming revenue, gaming costs, free play utilization, customer defection and retention, marketing costs, win per unit, revenue per unit of capacity, cost per unit of capacity and other factors that drive sustainable profits are most relevant. The key point is that a company should understand its operating environment, determine the key success factors in that environment and benchmark and measure performance for those factors that are most relevant to that market and to the profitability of the operation. The following flowchart highlights a few of the differences in benchmarking environments for a destination vs. a locals casino.

Benchmarking Process

Destination Casino (Market Dependent)	Locals Casino (Market Dependent)

Key Success drivers
- Asset Utilization
  - Hotel – ADR, Occupancy
  - Gaming - WPD, WSF
  - F&B – Covers, Avg Ck
  - Other – Ent, other rev
  - Revs per occupied room – hotel, gaming, f&b, other
- Cost & Operational Drivers
  - Dept cost margins
  - Rev per employee
  - Promotional costs
  - Marketing efficiency
  - Costs per employee
  - Cost per unit, per room, per unit of capacity
  - Dept performance drivers – labor, etc.
- Non-financial drivers
  - Customer perception (satisfaction, safety, other, service times, complaints, etc.)
  - Employee perception (satisfaction, turnover, unionization, grievances, performance)

Key Success drivers
- Asset Utilization
  - Gaming - WPD, WSF
  - F&B – Covers, Avg Ck
  - Gross and net Revs per unit capacity
  - Slot performance
  - Table performance
  - Slot/table mix
- Cost & Operational Drivers
  - Dept cost margins
  - Rev per employee
  - Promotional costs and free play utilization, churn etc.
  - Loyalty program – attrition, churn, new, etc.
  - Costs per employee
  - Cost per unit, unit of capacity
  - Dept performance drivers – labor, etc.
- Non-financial drivers
  - Customer perception (satisfaction, safety, other, service times, complaints, etc.)
  - Employee perception (satisfaction, turnover, performance, etc)

Apply Operational Benchmarks and Determine Gaps for Improvement	Apply Operational Benchmarks and Determine Gaps for Improvement

As noted above, benchmarks are often obtainable through public sources, or where not available, can be obtained through benchmarking studies prepared by consulting firms, including GGH, and similar services. Once the key data is identified and benchmarked, casino operators can determine the gaps in performance and set goals, objectives, timelines and actions for improvement.

ANALYSIS

The barrage of data available today can be quite overwhelming for an executive. The key is to make the analytics available to managers easy to access, read, use, understand and act upon. The competitive benchmarking exercise, assuming best practices, provides management with a roadmap for managing the casino or resort within a particular market in an optimal manner. Measuring performance vs. benchmarks, recognizing lagging performance, and understanding the underlying reasons for these gaps in performance is a critical first step. These analytics are normally historical and available through a DOR, a

flash report, a monthly or quarterly budget and monthly financial statement review, among other sources. This backward looking comparative data is important and allows managers to understand important trends in their operating performance, both positive and negative.

Optimally, these benchmarking factors should be managed through easily accessible dashboards and reporting which are customized to the sophistication level of the reviewer. Unfortunately, many casinos rely upon a cadre of analysts and reporting is often late, voluminous, subject to error and require an analyst mentality to interpret; consequently, the resulting analytics are often burdensome for the executive to read, interpret and act upon. Therefore, oftentimes the analysis simply sits unread and not acted upon, curtailing the efforts at performance improvement.

As an example of an effective management benchmarking tool, GGH developed a dashboard approach to managing player development (Host) performance at a casino operated by affiliates of GGH. This dashboard delivered data to the head of player development to bring accountability to hosts in an easy to use and interpret format. The following screenshot shows the information for one Host summarized and trended to provide actionable data.

The approach was to: 1) identify the current Host performance data, 2) utilize market data to identify a benchmark for better performance, 3) communicate and establish goals for each Host, 4) monitor each Host's performance for improvement, 4) reward those Hosts who were performing, 5) eliminate Hosts who were not achieving goals, and 6) continually monitor and update performance goals to establish "continuous improvement". This is basically the process for all continuous performance programs.

The end result of this casino marketing exercise was to 1) redeploy existing Promo Allowance dollars & Freeplay (which isn't free) more efficiently and effectively towards those customers of greatest value, 2) reduce gross Promo spend substantially, and 3) almost tripled market gaming win YOY %, which improved the bottom line substantially. This is one of many examples of the value of data analytics to improving the financial performance of any casino or casino hotel.
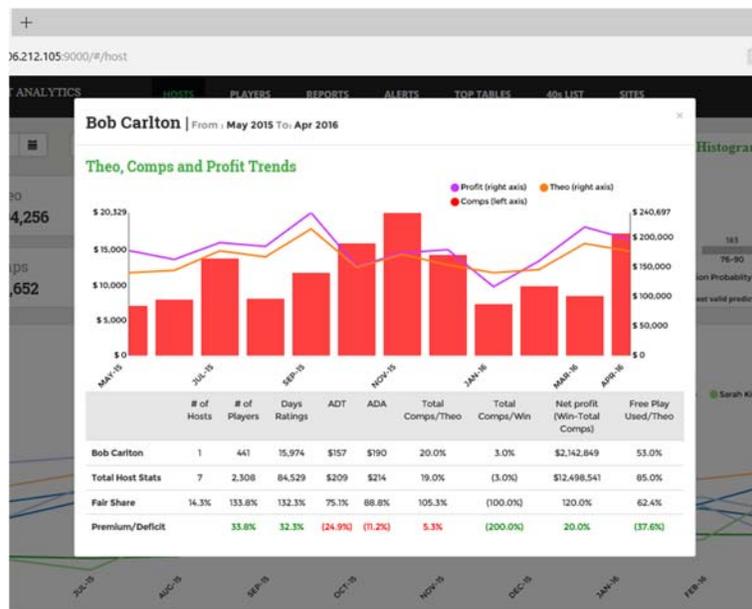
Utilizing the learning achieved through this real world process, GGH launched a JV called M^{2}G to create an automated dashboard tool that manipulates the data available in casinos and creates easy to use, actionable comparative dashboards for the use by executive leadership in making better decisions. These tools make performance optimization, including saving money, gaining Fair Share and creating profits much more achievable that ever before.

In addition to manipulation of this historical, static player data, as shown above, casino operators should be applying best practice statistical analyses to all relevant data to optimize all casino performance metrics. These analytical techniques include descriptive analysis applied to data and processes to determine the variability of data, trend analyses including regression analyses to determine the correlation of data for forecasting, hypothesis testing to determine the efficacy of decision making and gravity modeling and market assessments for market sizing and benchmarking property revenues against market opportunities. While not an exhaustive list, all of these techniques can be used by gaming operators to improve operations. Here are some further examples of analytical approaches that improve performance when applied.

Variance analysis is a very effective tool for analyzing data. Variance analysis provides the user with a representation of the dispersion of the data. Large variances or dispersion may indicate there is a problem with the processes underlying the collected data, which may require investigation. The following chart represents hold percentages from a slot floor at a casino that was in financial trouble. The hold data shows significant dispersion, as evidenced by the several periods where hold was negative. The level of hold variability shown in the graph is highly unusual.. In this instance variance analysis readily identified the problem for investigation and resolution.
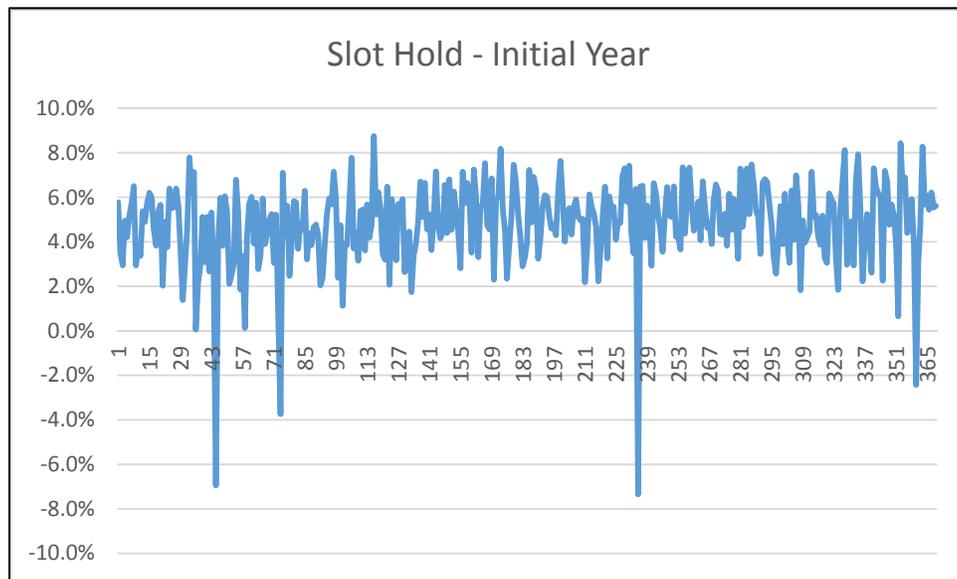

New management took over the property and, upon observing this dispersion of results, took swift action. Losses were isolated to a few customers and titles (multi-games). Those machines and customers were removed from the property and improvement was immediate. Property hold and revenues increased, promotional costs declined and variability was reduced significantly as can be seen in the following statistics.

Slot Hold Analysis			
	Year 1	*Year 2*	*Change*
Mean	4.8%	4.9%	1.1%
Median	5.1%	5.0%	-2.8%
Standard Deviation	1.8%	1.5%	20.4%
Sample Variance	0.0%	0.0%	
Kurtosis	1006.5%	59.2%	94.1%
Skewness	-199.6%	-53.3%	73.3%
Range	16.1%	8.7%	45.7%
Minimum	-7.3%	-0.4%	95.1%
Maximum	8.7%	8.4%	-4.3%

This reduction in variability can also be seen in the following chart of daily results for the year after action was taken.
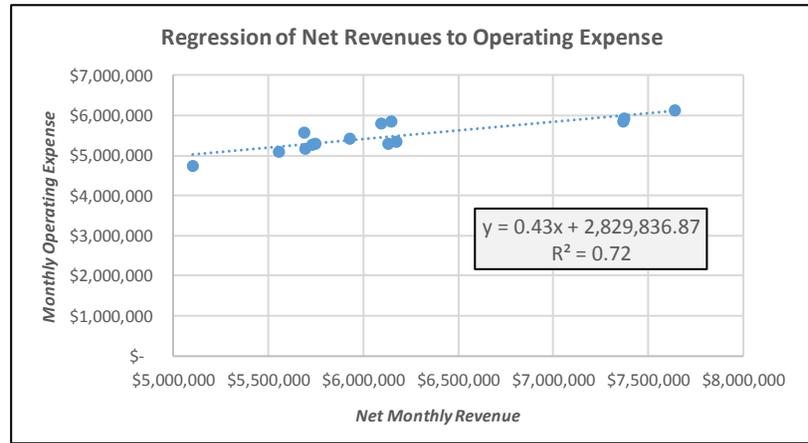
In this instance, appropriate analytical review identified the problem, lead to a tactical change in operations and, ultimately, correction of the problem and stabilization of the financial issues. These tactical changes *would not* have occurred without the identification of the problem to begin with – the very point of such data analytics.
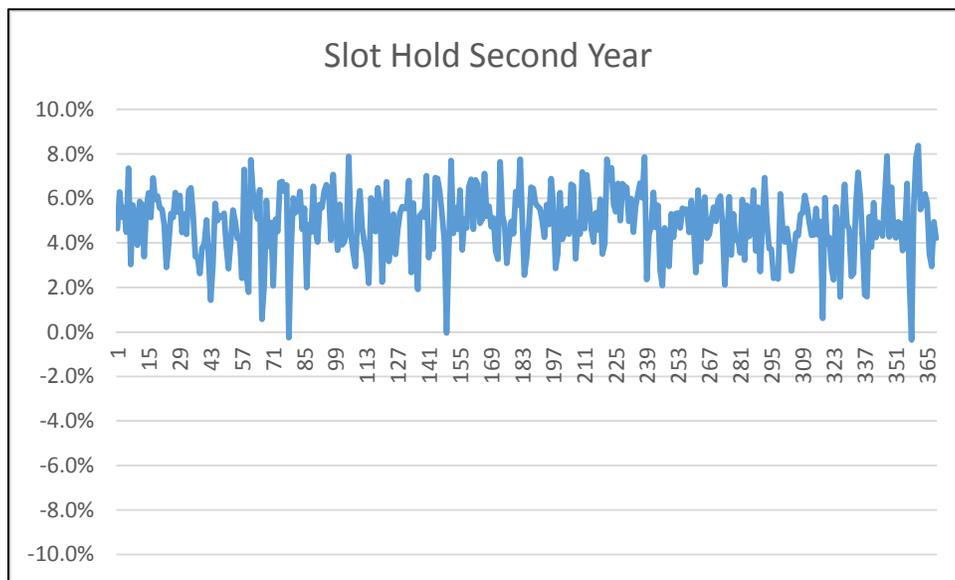
Regression analysis is an excellent tool for measuring the correlation of certain data variables. There are almost limitless uses for this analytical methodology including forecasting future revenues and costs. For example, regression analysis can be used as a tool for gaining an understanding of fixed and variable costs in a casino. As an example, the following table lists the monthly net revenues and expenses of a casino operation over a several month period. Performing a regression analysis yields a formula for the best fit

line through the plotted data. This formula, depicted as y = .43x + $2,829,836.87 implies that the fixed monthly costs of the casino are approximately $2.83 million and variable costs are 43% of revenues. This provides management with a tool to determine how their operating profits will change if fixed costs or variable costs were changed and the tradeoffs inherent in each.

	Net Rev		Expenses	
Jul-12	$	7,637,637	$	6,112,399
Aug-12	$	6,173,266	$	5,333,301
Sep-12	$	6,130,870	$	5,302,255
Oct-12	$	5,928,605	$	5,418,416
Nov-12	$	5,745,921	$	5,278,619
Dec-12	$	5,727,556	$	5,273,808
Jan-13	$	7,368,444	$	5,843,539
Feb-13	$	7,369,664	$	5,926,959
Mar-13	$	5,689,433	$	5,166,990
Apr-13	$	5,689,023	$	5,569,678
May-13	$	6,089,056	$	5,801,557
Jun-13	$	6,142,883	$	5,836,894
Jul-13	$	5,551,340	$	5,091,308
Aug-13	$	5,101,953	$	4,738,141

Regression of Net Revenues to Operating Expense

$y = 0.43x + 2,829,836.87$
$R^2 = 0.72$

Y-axis: Monthly Operating Expense ($-, $1,000,000 through $7,000,000)
X-axis: Net Monthly Revenue ($5,000,000 $5,500,000 $6,000,000 $6,500,000 $7,000,000 $7,500,000 $8,000,000)

These examples provide practical uses for using sophisticated mathematical and statistical tools for making every day decisions. These analyses should guide the strategic direction of the property and can be used as a tool to align managerial tactics and operating activities to create a sustainable, successful strategic position.

For example, in our slot hold analysis above, one of the strategic initiatives of the failing casino's turnaround strategy was to align marketing spend and products to a mid-market customer. The slot analysis and other analytics allowed the casino to reposition costs away from advantage players and to redeploy marketing dollars and capital expenditures to a higher yielding customer.

Hypothesis testing is a statistical inference process whereby one can draw a conclusion about a data population based upon information contained in a sample. In hypothesis testing we make a tentative assumption about a data population characteristic and then test whether that assumption is correct. This tentative assumption is called the null hypothesis. For example, we can test whether entertainment events have an impact on gaming revenues. In this case we test the hypothesis that entertainment events have no positive effect on casino gaming revenues. By analyzing gaming revenues for the days when there were no entertainment events and when there were events, we can test within a high degree of certainty, whether the events had a positive impact on gaming revenues.

GGH recently performed a hypothesis test on gaming revenues realized at a casino on Saturdays with and without entertainment events. We utilized daily gaming revenue data for Saturdays for which there was no entertainment event. Average gaming revenues for those days was calculated at approximately $402,000 with a standard deviation of approximately $62,000. In performing the test we also calculated the average gaming revenues for Saturdays on which there was an entertainment event. That average was approximately $416,000. We perform the test at a 5% level of significance (95% degree of certainty). The upshot of our analysis was that despite the average revenues being slightly higher on days with an entertainment event, there was not enough statistical evidence to prove that the events themselves were moving the needle. This analysis was buttressed by the fact that the average win per customer declined

on nights when there was an entertainment event. Apparently, customers who were drawn to the event were crowding out better customers who bet at higher levels. This data was used to reduce the cost associated with entertainment events, leading to increased casino margins.
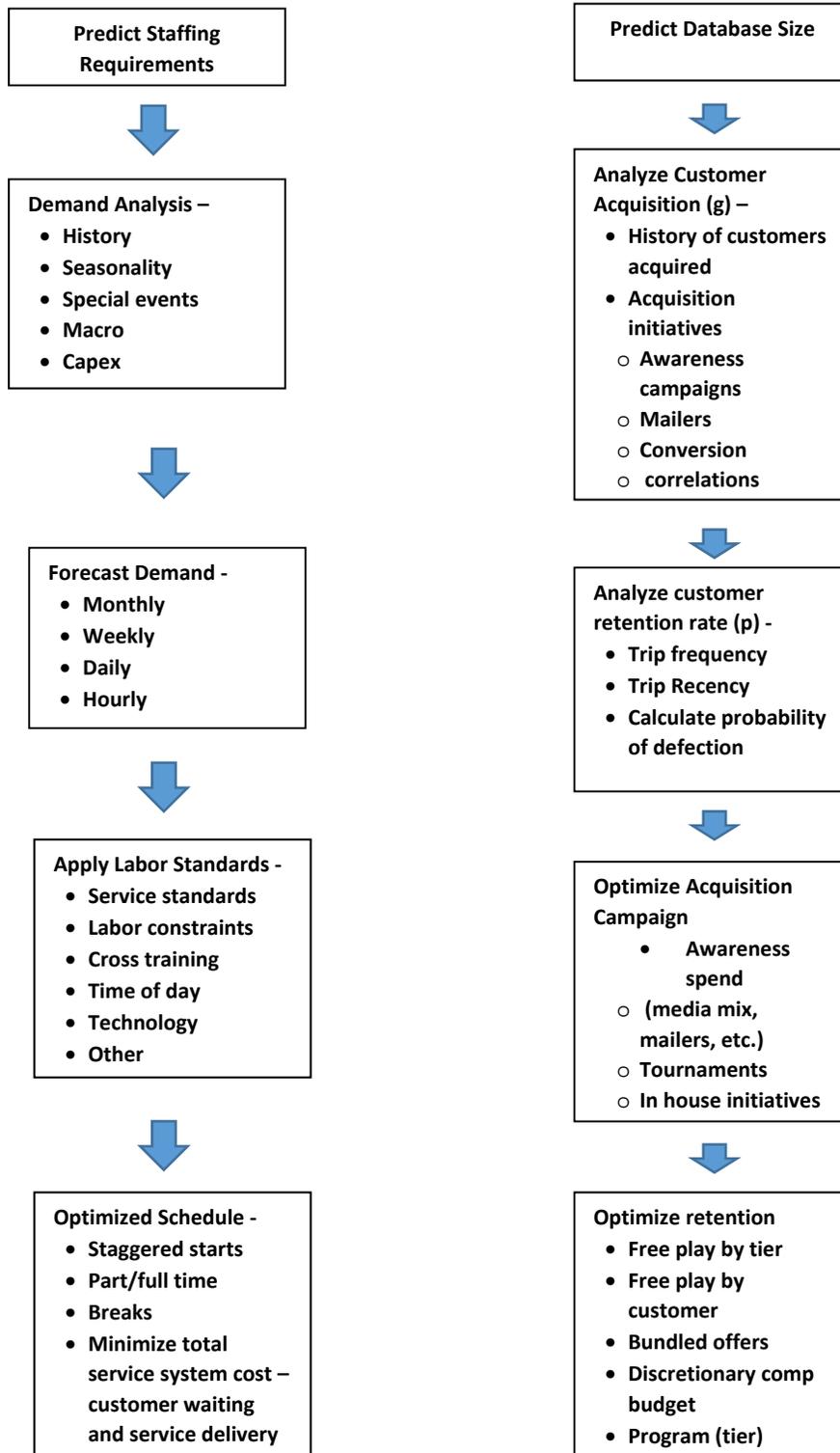
This is an example in which statistical analysis negated the age old axiom that entertainment contributed to gaming win (for this particular property and analysis) and provides evidence of the incredible value inherent in data manipulation.

PREDICTION AND DECISION MAKING

The next step in manipulating data to optimize casino performance is to use the resulting analyses to make predictions about the future to enhance appropriate strategic decision-making. There are multiple areas in which casino operators must predict or forecast future operations. This includes making predictions of slot floor performance when laying out a slot floor, predicting table performance when setting table spreads and limits, predicting hotel occupancy or restaurant covers to manage labor requirements, predicting market revenues to determine fair share projections, etc. Predictive analysis requires significant historical data and the application of sophisticated analytical tools to forecast future results. Some of these tools were discussed above and include single and multiple regression analysis, moving averages, the application of simulation techniques, hypothesis testing, Bass modeling for new product introduction and gravity modeling for predicting market share or total revenues.

Machine learning is a relatively new and growing area of the predictive modeling process. Machine learning is a type of artificial intelligence that provides computers with the ability to learn without specific programming. Machine learning allows the computer (machine) to teach itself about patterns of data and make predictions based on these patterns. In data rich environments like casinos, machine learning can be used to determine patterns of data for a host of applications like predicting the efficacy of a free play mailer based on past results, or recognizing slot machine occupancy and demand for restaurants seats. This is a very powerful development in data analytics and GGH is applying this technique in our data analytics programming. The following diagrams depict examples of predictive analytics processes that can be implemented in the gaming environment to either lower costs or drive revenues.

Predictive Analytics Examples

Predict Staffing Requirements	Predict Database Size

Demand Analysis –
- History
- Seasonality
- Special events
- Macro
- Capex

Analyze Customer Acquisition (g) –
- History of customers acquired
- Acquisition initiatives
  - Awareness campaigns
  - Mailers
  - Conversion
  - correlations

Forecast Demand -
- Monthly
- Weekly
- Daily
- Hourly

Analyze customer retention rate (p) -
- Trip frequency
- Trip Recency
- Calculate probability of defection

Apply Labor Standards -
- Service standards
- Labor constraints
- Cross training
- Time of day
- Technology
- Other

Optimize Acquisition Campaign
- Awareness spend
  - (media mix, mailers, etc.)
  - Tournaments
  - In house initiatives

Optimized Schedule -
- Staggered starts
- Part/full time
- Breaks
- Minimize total service system cost – customer waiting and service delivery

Optimize retention
- Free play by tier
- Free play by customer
- Bundled offers
- Discretionary comp budget
- Program (tier)

Predictive analytics and processes are the next frontier in optimizing gaming performance. In the examples above we can use predictive analytics to optimize labor costs and maximize the steady state size of the casino database. Optimizing variable labor means staffing to demand patterns and minimizing the total cost of the service system. GGH has found that most businesses (not just casinos) only look at one side of the service cost equation, i.e. labor deployment. A well designed predictive modeling process can analyze both the cost of delivering service and the opportunity cost of customers waiting in line.

GGH has designed a process that uses several different mathematical methods to arrive at an optimized schedule. These methods include trend and regression methods for predicting demand, queuing models for determining wait times and optimal staffing and optimization (linear programming) to optimize start times and meet shift demand patterns. By analyzing demand patterns, determining the drivers of demand and then layering in wait time standards based on queuing math, a casino can minimize the cost of understaffing (customer wait times or long lines) and overstaffing (too much labor cost) and deliver the right level of service at the right time. The application of our analyses have shown that this can lead to many millions of dollars of labor cost savings per year, improved customer service satisfaction and enhanced revenue in the typical casino environment – creating profits.

The model depicted above for predicting database size is the most important prediction process in any locals or convenience oriented casino. The value of a casino is directly related to the size of the casino database and the ability to maximize new customer sign ups and customer retention ratios is the biggest driver of the value of the database. An optimized analytics process that identifies correlations to marketing and consumer behaviors can have profound impacts on the health of the database i.e. its steady state size. Machine learning tools and sophisticated statistical analyses are the bulwarks in this process.

EVALUATE

The evaluation process closes the current analytical loop and the analytics process starts all over again. During the evaluation phase all of the analytical activities, predictions and decisions are reviewed and analyzed to determine if they are effective and if predictions and decisions are leading to optimized performance. During this process, variances from predicted results are identified and internal discussion revolves around reducing those variations.

Best practices dictate that mean variance and standard deviation is tracked and the trend of those variances is reviewed with each iteration of review. Going back to our staffing example, the following chart is an example of a variance analysis used to track the performance of a forecasting and scheduling process at a restaurant shift in a locals based casino. The report shows that the forecasting process is mostly in balance but the actual cost was well in excess of the standard cost on weekends. This presents an opportunity to refine the scheduling process in the following week and reduce labor costs while maintaining guest service levels.

Cabaret Restaurant
Server Standard to Actual Comparison
Total Cost
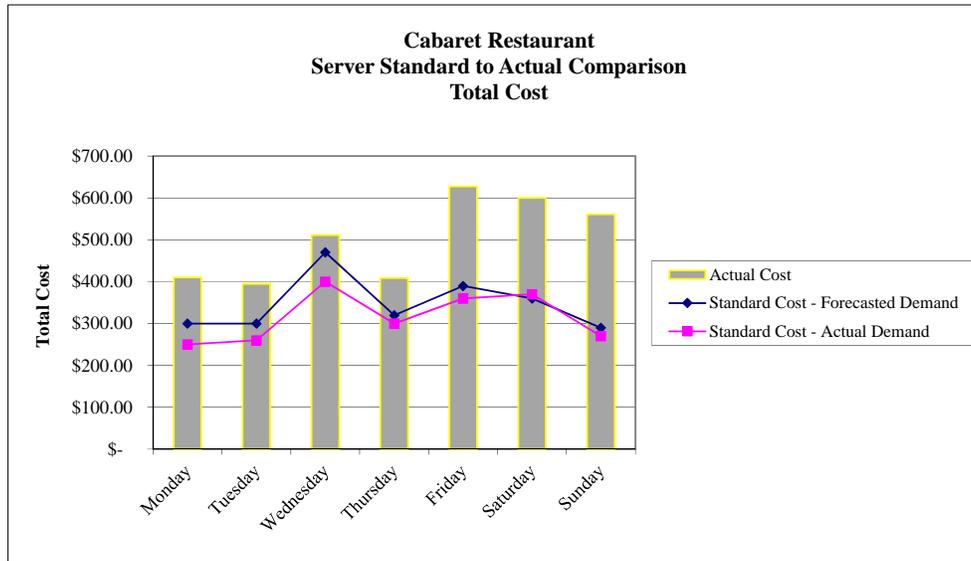
REVOLUTIONIZING DATA

Let's revisit the baseball analogy that we alluded to at the start of this paper. In baseball, Batting Average, Home Runs and Runs Batted In are no longer the main drivers of decision making by savvy general managers. The WAR statistic now rules the day. It's time that the casino industry took notice.

Win per unit per day, table hold and coin-in have long been the fall back statistics for gaming centric casinos. Applying the WAR statistic for gaming suggests looking at a slot machine as if it were a player on a baseball team. Instead of win per unit, which is analogous to runs batted in, we would apply a statistic such as revenue above replacement. This is fairly straightforward and, in fact, is part of the yield management process on the hotel side of the business. Developing this statistic requires gaining an understanding of the characteristics of each slot machine - including title, par values, average bet, typical occupancy, etc. A casino manager might look at location as analogous to fielding position and consider calculating the win above replacement for slot machines in different locations of the casino or vs. other denominations, etc.

A similar process could be developed for optimizing promotional allowances or free play. A casino might have a budget for monthly promotional costs and look at the cost above replacement per promotional allowance for different database customers. This would allow the casino to optimize the offer by tier and customer.

These are only a few of the ways GGH seeks to revolutionize data analytics in the casino industry. It starts with a willingness to discard old beliefs, analyze data and the story its output tells us in new & better ways, and trust the new technologies to guide us to better decisions and greater profits.

CONCLUSION

We have presented a series of best practice processes and several examples for utilizing data and information to optimize operating performance in the gaming environment. These processes include creating a series of benchmarks around key performance metrics, measuring actual performance against benchmarks, applying sophisticated statistical analysis techniques and machine learning processes to create business intelligence and predictive models, using those predictions to make more informed decisions and then monitoring results to determine if the processes resulted in better outcomes.

GGH also presented the concept of revolutionizing the analytics process by borrowing from the professional sports industry and using new metrics for optimizing decisions around managing the slot floor or promotional costs. The era of big data has arrived and while most casinos recognize this and are well along the path to capturing data, the proper analysis, management and monitoring of that data will be required to make investments in data collection worthwhile. While all casinos collect massive amounts of data, it is GGH's experience that most operators do not have the staff resources, experience or capability to truly analyze the data and identify substantive & actionable opportunities to either save money or increase profits. Outside consulting companies, such as GGH, can fill that void in a cost effective and efficient manner. GGH will be happy to discuss our services with you further.

ABOUT GGH AND THE AUTHOR

GGH ("GGHSP.com") is a consortium of consulting firms serving the world wide gaming industry. GGH member firms are Global Gaming & Hospitality, LLC and Morowitz Gaming Advisors, LLC. GGH provides myriad services devoted to the gaming industry from pure consulting to M&A advisory. Service lines include Industry Knowledge, Capital Markets and Asset Management – exclusively dedicated to casino operators and investors. Most recently, GGH was the gaming licensee acting as owner/operator in the successful turnaround of the former John Asquaga's Nugget in Sparks, Nevada, a 1,400 hotel room casino resort.

GGH used all of its available experience, tools and resources to acquire, operate, turn-around and sell this large casino resort, which was acquired in partnership with one of its clients. Other recent initiatives include the launch of M^2G, a data analytics dashboard platform that allows casinos to visualize and manage casino data to make optimal decisions involving marketing and promotional spend, labor deployment, capital expenditures and other important facets of casino operations. GGH also recently launched initiatives in the emerging AML reporting and compliance arena. These varied experiences have allowed GGH to develop a unique perspective & knowledge regarding casino operations throughout the U.S.

This is the second of a series of "Industry Knowledge" White Papers intended to illuminate certain aspects of the gaming industry. The first paper, "Factors Affecting Profitability at Casinos in the Competitive Northeast" is available to download at www.gghsp.com or by simply requesting a copy from the author, email address below.

Cory Morowitz is the author of this study and one of GGH's three managing partners (along with Carlton L. Geer and Michael S. Kim). He is responsible for the firm's industry knowledge and analytics practice and has consulted to gaming firms throughout the world for over 25 years. Mr. Morowitz received his MBA from the Wharton School of the University of Pennsylvania, has been an adjunct professor in Drexel University's hospitality program and is the author of numerous studies, articles and white papers. This is the second of a series of White Papers that GGH will be releasing for the benefit of the gaming industry. Cory can be reached at cory@morowitzgaming.com.