

# Business Intelligence (BI) System for Budgeting and Customer Satisfaction

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## Abstract

This research is about a casino company that wishes to use Business Intelligence (BI) system to solve their budgeting problems while attracting customers. They provided the dataset required to analyse their two casino branches and find what actions that they need take, with the help of visualizations. After analysing the visualizations, it was clear that there were many machines that their customers are not found of and that video machines are the most popular among the three types of machines. The least played type of machine was vpoker and only two manufactures provide them with the machines. The likely reason for people do not playing vpoker is that it requires mental strength and mathematics. It was also clear that customers come to the casinos in April, possibly due to holidays. With the help of new technologies, they can gather more information from their customers, without upsetting them and increasing the security to prevent vandalism and destruction of property by angry customers.

**Keywords**— Business Intelligence, data visualisation, customer satisfaction

## 1 Introduction

QuidCash is a casino organization that entertains many with the help of machine games that they provide. They own two branches, Aries and Libra that are open throughout the day. Occasionally, to attract customers, they organize extravagant events. The main money maker for the organization are the machine games that they provide. There are three types of machine; vpoker, video and reel. As the organization depends mostly on machines to generate revenue, they do not require a lot of employees to do the dealing and handling of the chips. They rely on cameras and guards as means of security [1].

They are focused on finding ways to be more competitive against their competitors while minimizing the cost that they have to spend for machines. Therefore, with the help of Business Intelligence, they will be able to find out what machines are targeted by their customers [3], when do most of the customers visit the casino and what measures they can take to improvise their market strategy [4]. Figure 1 shows the data exploration provided by QuidCash used for making the statistical reports.

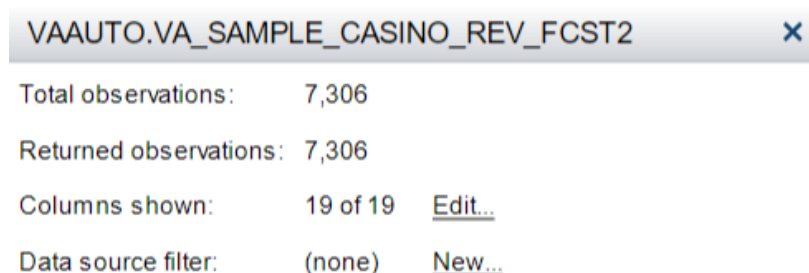


Fig. 1 Data Exploration for QuidCash

## 2 Business Issues

Years ago, casinos tend to use card, reel and dice games to generate revenue. Many of these games use mathematical calculations to determine who will lose or win. Playing poker by the poker table with friends while the dealer deals them the cards was one of the reason people come to casinos. People enjoy the company of others while they play these games. Furthermore, cheating was a habit many gamblers do to win and often spend many, bribing the dealer to help them win. Moreover, security was also an issue as casino tokens can be stolen at the cashier station.

As the years pass on, so does technology and the behaviour of people. These days, people prefer to interact with computers instead of other people, though they may be accompanied by someone to a casino. Casino companies found ways to make these people to come and play at their casino by placing up machine games that are similar to the original. Instead of a dealer dealing the cards, the machine will distribute the cards for the players [5]. Customers can play these casino games easily without cheating and theft of casino tokens were less. This led to fewer employment in casino and more technological equipment as security.

As QuidCash uses machines to generate revenues, spending money for employees was not an issue for them. Even though people have difficulties stealing from the token counters, there are other ways of stealing [3]. For example, by breaking the machines and taking money from it. However, this occurs very less.

Money was mainly spent for the maintenance of the machines as some of the customers that visit them has bad temper and also from occasional vandalism. These machines require maintenance every few days or so. They also have to spend a fortune on electricity as most of the games require electricity [4]. QuidCash have also noticed that many of the machines that they provide are left untouched for hours while others have lines queuing up for them. They have also noticed that during some months of the year, people hardly come to the casino.

## 3 Proposed Solution

Business Intelligence (BI) can provide solutions for the problem that the organization is facing by analysing the data that they have collected over the years and using it to produce statistical reports and graphs that they can refer to on the future. QuidCash can use these reports and graphs to see what type of games are least played by users, which manufacturer provides the popular machines and what machine gamblers spend their money on. Since it is the technological era, video games will be the most popular among the customers [6].

With the help of hardware such as cameras, QuidCash can get new data from the customers. They can monitor through CCTV and categorize the age and gender of their customers. This will allow them to know when these age groups come to the casino often so that they can hold events and also introduce new machines to see if they are interested in them, while increasing the security and decreasing property damage and loss of money [7], [8].

## 4 Support Factors

Business Intelligence is enhanced with visualizations, alerts, and performance measurement capabilities. It provides decision makers with valuable information and knowledge by increasing the variety of data sources as well as structured and unstructured information[9], [2], [3].

### A. Large Data Volumes

BI solutions provide managers the ability to effectively utilize large data volumes that they have accumulated. QuidCash has two casino branches, and the information that they hold are quite large. Since BI solution offers large storage space, the organization can easily manage their datasets. They can also easy add more data without disturbing the data that is currently in the system.

### B. Complicated Decision Making

BI offers a wide range of presentation styles such as graphs, scatter plots and treemap. To make it easier for the decision makers of the company to make complicated decisions, these presentation styles make it easier for them to understand the issues faced by the company just by analysing the graphs.

### C. Need for Quick Reflexes

As the company grows and expands, more data are inserted to the dataset. BI makes sure that the decision makers get the information immediately without delay, by updating this information every now and then.

### D. Technical Progress

With the help of BI, QuidCash can do data mining or text mining software to get more information form websites and news articles. They can also do data warehousing if they wish to combine the information of both of their casino branches. Cameras can be a useful in collecting data as it allows users to see what goes

around in the casino; example, how many people play a single machine instead of asking every individual what machines that they have played.

## 5 Required Technologies

### 5.1 Organizational Memory

Organizational Memory focuses mainly on the storage of intellectual resources where they can be access and used later on the future. It allows enterprise-wide search meaning that QuidCash can easily manage their two branches with a single touch of a button [9], [10]. The technologies related to Organizational Memory are:

1. OLTP (Online Transaction Processing System)  
OLTP can store the data of how much the organization is spending which can be later referred back to when cutting down cost or to see how much they spend monthly or annually on electricity per casino branch or together.
2. ERP (Enterprise Resource Planning)  
ERP systems is a shared databased that supports many functions that can be used by different departments. The accounting team can use it to decide the budgeting for the casino and the sales team can use it to find ways to increase the revenue. Since ERP provide the synchronized reporting, both the teams can handle their tasks without any delays or issue.
3. Data Warehouse  
Data Warehousing can be used to analyse the data for the two casino branches; Aries and Libra combined, such as what the most popular game is, when do people come to the casinos the most and how many machines they own altogether. They can use the combined data to decide what is the best path they can take.

### 5.2 Information Integration

It is the process of retrieving (structured and unstructured) from different sources, which then facilitates insight creation. The technologies related to information integration are:

1. Environmental Scanning  
Environmental Scanning can be used to find what attractions and games that other casino organizations offer that attract their customers.
2. Text mining/Web Mining  
Text mining/Web mining can be helpful for QuidCash as it helps out to detect the current trend, what games people are willing to play. They can look for pictures or videos that people have posted online and use it to find what kind of customers are attracted to what type of games.
3. Web scraping  
Web scraping can help the casino by providing articles or news about popular casinos around the globe; BuzzFeed is a popular website that provide news, newsletters and articles about different topics. Decision makers can easily get answers on how to attract more customers, what sorts of games are most popular among the young adults and also possible make it possible for children to enter into some areas of the casino by going through the articles that talk about these types of integrations.
4. IoT (Internet of Things)  
Not all time cameras can be useful as a means of security. Sometimes guards are required to fight off violent customers. With the help of IoT communication among the guards and the cameras can be of ease. They can use cameras to search through the casino to see if any customers are of threat and immediately alert the guard via an earpiece.

### 5.3 Insight Creation

It helps to identify patterns, trends and relationships in the data and information and develop intuitions from the information in order to make better decisions. Technologies related to insight creation are:

1. Data Mining  
QuidCash can mine from the data that that they have collect to find patterns, such as what months are the profit rate the highest, what types of machines are least used, what games are used most frequently and also what manufacture provides them with the machines that are used the most.
2. Business Analytics

With the help of Business Analytics, they can focus of developing fresh ideas by analysing the data after mining them. For example, introducing a new type of machine or holding events in certain months.

3. Real Time Decision Support

Real Time Decision Support can help decision makers in the organization to decide what are the best options available and what action that they can take to overcome the issues. They can look at the reports and see what machines can be replaced and what cannot.

5.4 Presentation

To present the results discovered by insight creation, depending on the role of the user for them to make the best conceivable decisions. Technologies related to presentation are:

1. OLAP (Online Analytic Processing tool)

QuidCash can use OLAP to find solutions by looking at different aspects of the issue by selectively query data. They can check how many customers come every month and how much they spend on each type of machine. They can use it to figure out how to increase revenue on the months where customers come most frequently.

2. Visualization

Visualizations can be useful when board members of the organization gather and hold meetings. They can be easily used in slides and displayed to others and described.

3. Dashboards

Dashboards is a customised interface that has a navigable layout with is displayed through tables, charts or graphs. These interfaces constantly changes allowing as more data are added. This allows the organisation to always receive the updated report. They can be useful in the for the decision makers of the organization as less mistakes will be made.

6 Result and Discussion

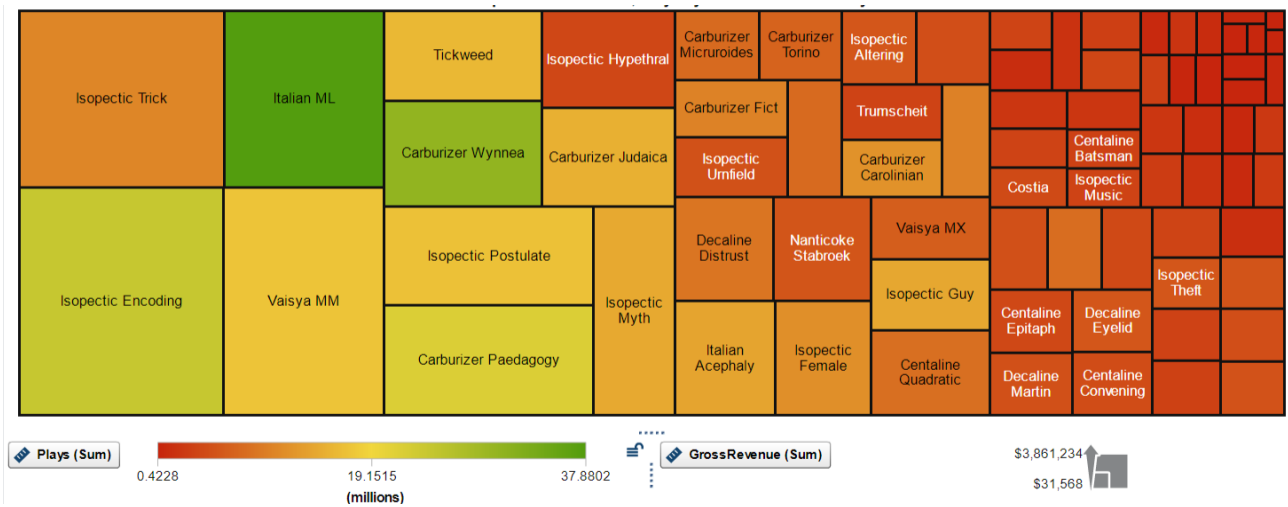


Fig. 2 Treemap of Gross Revenue, Plays by Manufacture Hierarchy

Figure 2 is a Treemap of Gross Revenue that has applied Manufacturer hierarchy. This data shows the number of machines which are of type video that is provided by the manufacturer Entellus. As the colour goes redder, it demonstrates that these video games were played very less compared to the ones in green or yellowish-green. This shows that there are lot of machines that customers are not interested in playing. Since machine costs a lot of time and money to maintain them, furthermore electricity to keep them running, replacing these machines to something new and exciting, such as the Italian ML or Isopectic Encoding can help the organization to reduce the amount of money on things that does not make much profit [11]. Customers can play these games instead of queuing in line to get a chance to play. If there are more of the same video games available, many customers can play it without delay.

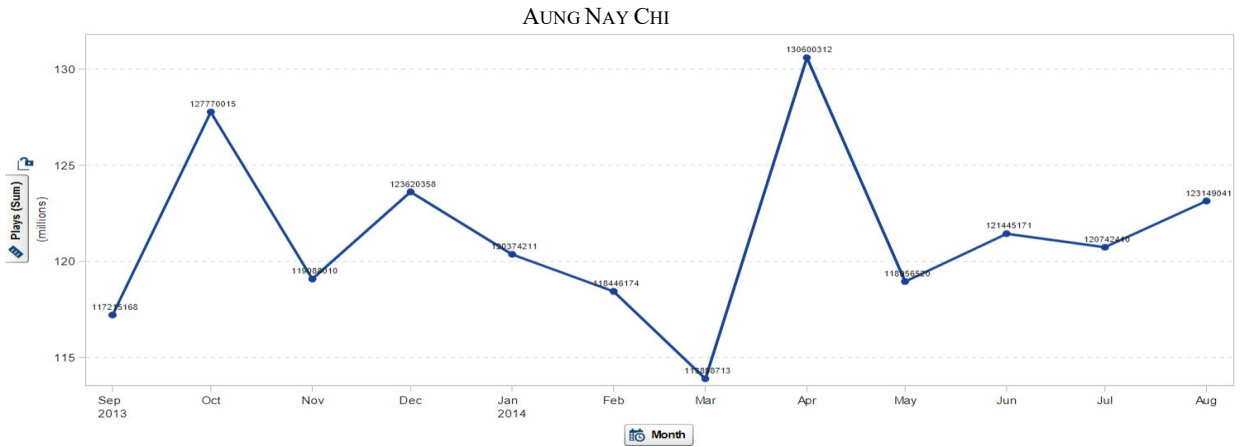


Fig. 3 Number of Plays by Month

Figure 3 is a Line graph that demonstrates how many customers have played during each month. The graph shows that during April, people tend to come to the casino to gamble more, compared to the rest of the months. The increase in numbers may be the result of a peak season for holidays of an age group. During the month of April, the organization can put up events or introduce new machines and features to make these people to spend money. To increase revenue, that could also try advertising their casino on social media.



Fig. 4 Gross Revenue by Month grouped by Machine Type

Figure 4 shows the Gross Revenue by month, grouped by the Machine Types. Looking at the line graph, it shows that the Gross revenue generated by video based machines are higher compared to vpoker and reel. We can conclude that many customers are more into video based machines than the normal/traditional card related games. Peoples interests change due to the technological improvement, thus the low revenue from reel and vpoker type machines. The organization can introduce more of the video machines, or they could also replace them with another video machine. Reel and vpoker requires luck and skills which is also a possible reason why people tend to avoid in these type on machines, as they may lose more money than they do when playing video based machines.

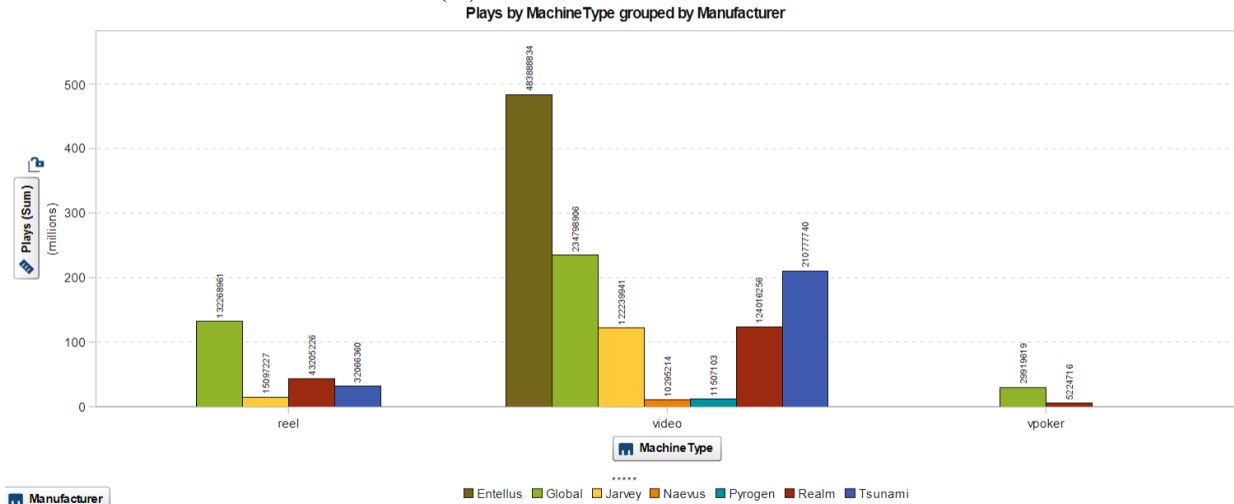


Fig. 5 Number of plays by Machine Type grouped by Manufacturer

Figure 5 shows a bar graph that displays the number of plays by machine type and grouped by manufacturer. The graph shows that vpoker is the least commonly used machine in the casino and only two manufacturers supply these machines. It is safe to say that vpoker machines are not the least liked casino machine as it is played the least among the machine types. Video based machines are the most popular gambling machines in the organization and has seven manufacturers that provide these machines. However, among all the seven manufacturer two of them are used the least. There is a possibility that these two manufacturers make games that are not in trend or people do not enjoy the games that they make. Entellus provides the most played video based machines. QuidCash can ask this manufacturer to provide more of their finest video based machines, based on Figure 2.

## 7 Challenges in Implementation

Making decisions are not also easy. To make the business grow, decision makers are required to make very risky choices. When implementing these choices that they made, not all the customers feel pleased about it. If a customer has been visiting the casino for over 3 years, and they see changes happening, they may not feel comfortable about it; possibly because they are used to seeing the casino arrangement and the games that they provide. There is a chance that people will not visit the casino as often as they did before.

Even though there are machines that are played the least among the customers, there may be a few who may enjoy and play it when they visit the casino. However, if the implementation were to take place, the least played machines need to be replaced with something new. There is a high chance that these customers may not visit the casino if the machine that they love is gone.

Another challenge that the organization may face it choosing what type of machines that they want to purchase. Since video-based machines are the most popular, they may choose the most frequently played machine. Nevertheless, this does not mean that all the customers may enjoy playing it all the time [10], [12]. There is a likelihood that people may want something other than the machines that they already have.

Since the organization never collected the age groups of their customers, it is hard to say what groups are playing what type of machines. If the number of young adults who visit the casino during certain months of the year increase, it would be difficult for the organization to know what new machines they should introduce to them. Furthermore, it is hard to say what age groups come to the casino frequently.

## 8 Best Practices

Business Intelligence software is quickly becoming the backbone for many organizations. However, restructuring an organization is not easy. There should be proper processes and tools required in order to achieve the goals of interpreting BI in to the organization [13], [12], [14]. Before implementing the BI system, QuidCash must make a list of questions that requires answers and know what data are needed in order to solve these questions. They may have over 40 data columns and only 15-20 data columns are needed to solve the issues. They should also create a budget and the items that they need to buy.

Once that they have found the data required to start up the system, they should first train the staff members and let them get familiarized with it. If they rush the implementation, the staffs may get confused, which can result in errors when compiling or system failures. Therefore, it is best for the organization to start using the BI system

slowly, and as the staff gets used to it, expand its functionalities at a steady rate. Starbucks is an example of a company that uses BI in business. They started the use of BI small, allowing their staffs learn how to use it. They then learned what kind of drinks customers like and during which season are they sold most frequently. Without the staff knowing how to use the system, it would be impossible for them to get this information. Many FNB companies use this practice in order to maximize their operational efficiency.

Another good practice when implementing the system is to have rules that protect the system from viruses or malware. Not all the staff should be allowed to enter data. Furthermore, before purchasing hardware (camera, earpiece) and software (CCTV monitoring, SAP), they should test them to see if they are in good shape and within the budget or worth investing. Many food chain companies do budget before purchasing items from suppliers; either for napkins, burger buns or ketchup. Good Times Burger is a famous company that does annual budgeting [15].

## 9 Conclusion

Casinos generate trillions of dollars annually even though they may not use BI. The main reason for people to come to casinos is to have a quality time. Yet, with the implementation of BI system in the casino, they can ease the work for their staff by generating reports automatically. This can save up a lot of time for the decision makers of the casino to make difficult choices [16]. The same applies for QuidCash. Once they implement the system and train their staff members on how to use it, many hours of work can be shortened while maintaining the profit margins. Additionally, it will allow them to know what machines can be replaced to cut cost [17], [18]. With the help of the hardware they can record new data such as age groups, gender and visualise who comes to the casino most often.

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