BA 5200

Business Case Report;

Rozsa Center for the Performing Arts

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Executive Summary

The Rozsa Center for the Performing Arts, located on the campus of Michigan Technological University, is the largest performing arts facility in Michigan's Upper Peninsula. Home to an 1,067 seat theatre and host to over 100 individual events, the Rozsa Center serves over 40,000 patrons from both the campus and broader community annually. After a large cross-departmental merge with the University's Department of Visual and Performing Arts (VPA) in 2014, the Rozsa Center's operations were shuffled to accommodate new workloads and responsibilities. In the years post-merge, the Rozsa Center has continued to grow and expand in its new role as part of the academic VPA department, yet some of the Rozsa's non-academic professional functions have suffered as a result of its new organizational structure.

Made up of three primary operational divisions - Programming, Production, and Marketing - and involving several other external (not reporting to Rozsa or VPA supervisors) divisions - such as Rentals and Ticketing - the Rozsa Center faces challenges that range from labor shortages and budgetary constraints, to University imposed bureaucratic red tape and insufficient IT support, to the logistical challenges of presenting professional performing arts events in such a geographically remote location. Finding a single feasible solution that would solve all of the Rozsa Center's challenges together would be difficult and perhaps impossible. As a consulting team, we considered a selection of these problems and proposed feasible and efficient possible solutions to what we considered to be the major problems at the Rozsa Center.

Consumer patronage is central to the Rozsa Center's business ecosystem, thus being able to understand audience preferences is vital the business's success. We first identified that the Rozsa Center is ineffectively using the customer data available to them through the Ticket Office

and, as a solution, historical ticketing data was analyzed to determine whether any consumer trends emerged. We created a detailed analytical report of consumer data, which contained important insights of informations extracted from the raw data made available through the Ticket Office, including identification of the Rozsa Center's most valuable customers and performance preferences. We also clustered users based on interest and their purchasing behavior. Taking our analysis of the historical data one step further, predictive modelling was applied to the available data to determine whether any patterns about consumer preferences or other future purchasing behaviors could be forecast. Predictive modeling, which can be considered a *learning machine*, can assist with the better identification of human behavioral trends. In order for the *machine* to learn from the data available to us, we designed a machine learning based predictive model to understand the preferences and behavior of the Rozsa's customers based on our detailed report of consumer data.

Second, we identified that the data currently being collected by the Ticket Office and Rozsa Center Marketing staff is severely limited; as a solution, we have proposed a strategy for collecting new customer data in the form of an audience survey, which would, in the future, be corroborated against the historical data analysis trends. The survey was created based on previous market surveys conducted by the Rozsa Center, and consists of eight individual questions that specifically address consumer opinions about both the Rozsa Center as an organization and specific performances held in the venue. A strategy for administering, collecting, and analyzing the data was proposed, with a realistic and feasible implementation date suggested.

We designed each of these proposals to be incorporated into the Rozsa Center's regular business operations and used for analytical purposes. We recommend that the Rozsa Center use the predictive modeling prototype on routine basis. The recommended integration in the current business practices should lead to a better strategic advantage over competitors as it will lead to greater revenue generation and, hence, lead to an increase in profits. Our recommended final solutions are aimed at creating a competitive advantage for the Rozsa Center by using feedback data to adapt to market changes and dynamic consumer preferences. These solutions are intended to be more agile, dynamic and artificially intelligent.

Business History

Since 1999, the Rozsa Center for the Performing Arts has been the home of all performing arts activities on the campus of Michigan Technological University. Costing approximately $20 million ($5 million through state funding and $15 million through privately contributed funds) the 80,000 square foot venue has dramatically expanding region's artistic offerings. With 1,067 seats, styled in the color of local minerals, the main theatre is the largest of its kind in the Upper Peninsula, and the building's unique architecture pay homage to the Copper Country with a roof incline that echos the look of mining shaft houses and hoists. As stated by the mission statement, "the Rozsa Center welcomes everyone. From the feeling in our lobby, to the events on our stage, the Rozsa Center's staff, performers, and patrons foster personal connections through all of the arts at Michigan Tech. Our goal is to inspire, excite, and spark imagination in Michigan's beautiful Upper Peninsula."

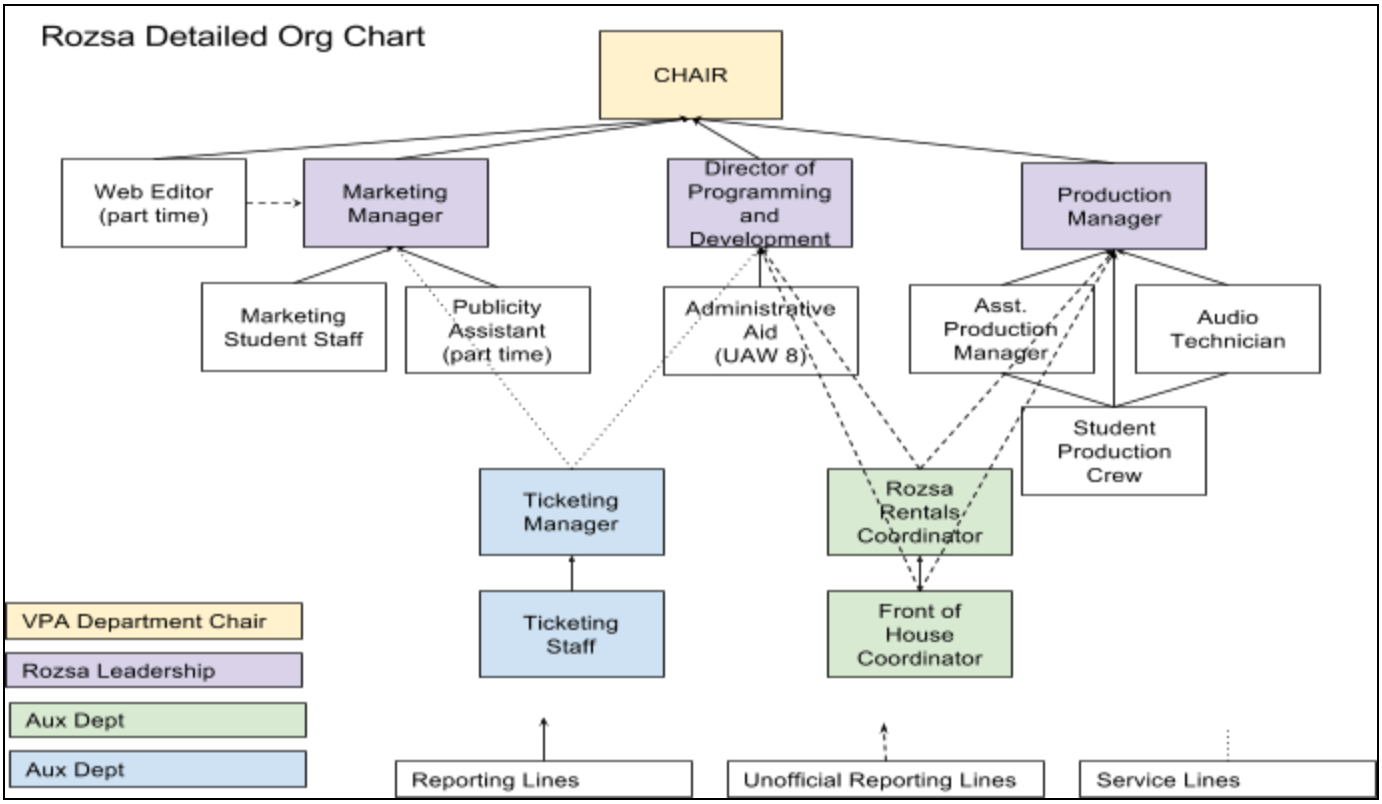
Organizational Structure

The Rozsa Center operates as part of Michigan Tech's academic Department Visual and Performing Arts. As a result of a large university realignment, the Rozsa Center, which was before a division of the university's Auxiliaries Services department, merged with the VPA department in 2014. This realignment was a top-down decision and interrupted the former information systems that were in place that coordinated Rozsa events and communication between the many different functions that contribute to Rozsa operations. The realignment flattened the Rozsa Center's leadership structure, thus minimizing the power and decision making abilities of the Director position. After the merge, communication channels were fractured, reporting lines were severed, and historical data regarding past events and patrons was lost. This merge resulted in the loss of oversight of certain operational functions, such as the Rozsa Center's front-of-house, concessions, rental, and ticketing operations (all of which remained functions of Auxiliaries Services), and the redistribution of certain responsibilities, including the addition of the management of all VPA productions and marketing efforts.

Primary and Supporting Activities

The Rozsa Center is made up of three primary operational divisions - Programming, Production, and Marketing - and requires the intimate involvement of several other external divisions - such as Rentals and Ticketing, which are both units under the Auxiliaries Services department - to function. Post- merge, it has been difficult to effectively and optimally communicate and coordinate with employees whose reporting lines lie outside of the Rozsa Center. The following detailed organizational chart outlines the individual jobs, including

reporting lines and other lines of connection between both the internal and external employees that contribute to the Rozsa Center's central operations:



The primary activities of the Rozsa are event production and presentation, which include thes the scheduling, contracting and execution of all events that take place in the venue. The Rozsa Center contracts professional touring performances and lecture speakers for their three series: the Presenting Series (which is comprised of all of the professional performing arts productions that are hosted in the Rozsa Center), the Class Acts series (which is specific to daytime programming for K-12 students), and the Van Evera Distinguished Lecture Series. The marketing and associated public relation functions are managed by the Rozsa Center marketing manager, who works exclusively for the VPA department. The Rozsa Center also coordinates

their own funding/developmental initiatives and community engagement initiatives that include arts/arts education outreach in the surrounding community.

The supporting activities of the Rozsa Center include the management front-of-house operations (the management of the event ushers, and additional organizational and safety support at the time of a given event), facility rentals management, ticketing management, and the coordination of catering/concessions services. All of these activities are vital to the Rozsa Center's operations, yet none of the supporting activities are overseen directly by Rozsa Center staff.

Business Strategy, Competitive Environment

The Rozsa Center's revenue strategy consists of sourcing income from event tickets, facility rental fees (primarily from non-university rentals), the solicitation of grants and donations, and the responsible maintenance of endowment returns. The Rozsa Center also actively seeks out collaborative partners from the university and the community to cost-share the portion of select touring productions, boost marketing efforts and, potentially, to generate new rental income. The major expenditures of the Rozsa Center are equipment, expendable technical supplies, show costs (contract fees), and staff/crew labor costs. There is also a significant facility repairs budgets.

The competitive environment of the Rozsa is nontraditional. While there is no direct competition in the form of another large performing arts venue in the area, the small size of the community and large number of community events (in any form, such as a high school athletics game, a show at the Orpheum Theatre, or a community event hosted at the local library) all

contribute to the competitive landscape. On campus events, such as entertainment events held in the MUB, or athletic games held in the Student Development Complex, are among the Rozsa's closest competition. The Calumet Theatre is considered to be a minor source of competition, and the performing arts facility at Northern Michigan in Marquette is too far (two hours) to be considered serious competition.

The primary competitive advantage of the Rozsa is its facility, which is the largest of its kind in the UP. The Rozsa Center's professional staff is also a significant source of competitive advantage because of the level of knowledge and professional expertise the contribute to the Rozsa's operations.

Identified Problems

One obvious misalignment our team identified over the course of our conducted interviews was within the Rozsa Center's events management process. There are discrepancies between the academic timelines and priorities of the department and the professional timelines and priorities of the Rozsa Center staff - academic staff prefer to work with long timelines and flexible schedules to accommodate learning, which is not conducive to the professional and profit generating goals of the Rozsa Center's professional staff. Second, the communication channels used between Rozsa staff and other collaborators lacked sophisticated technical support, and thus was prone to human error. The only technical tools currently employed at the Rozsa are Google Calendars for event scheduling, Google emails for communications, and Google Drives/university drives for sharing and working on files. Third, budgetary constraints

affect several aspects of Rozsa operations, including Production operations, marketing initiatives, programming and outreach efforts, and ticketing operations.

Additionally, as previously mentioned, coordination between the Auxiliary Services staff and VPA/Rozsa staff, including the official and unofficial reporting lines, was complicated as a result of the 2014 merge, which separated several key operations from Rozsa Center supervision - namely Rozsa Center rentals, front of house, ticketing, and concessions activities. The Rozsa Center's Production division has implemented its own system for tracking equipment inventory and facilities usage data, however, these processes are limited to only Production operations and there are no formal organizational or inventory management processes that the faculty abide by. According to the Rozsa's Production Manager, George **"**My job would be easiest if there was no academic department," because student involvement makes inventory management very difficult. There are also no formal data management processes in place for other areas of Rozsa operations. The last marketing survey was conducted in 2012, and the Rozsa has not been actively collecting enough data since that time. What is needed, according the interviewees, is both historical data about the facility and business (including facilities usage, ticket sales, and rentals data) as well as a method to collect new data.

We also identified that the communication challenges were inhibiting the Rozsa staff from operating as efficiently as possible, and improved communication and collaboration mechanisms could be achieved without straining the already constricted Rozsa Center budgets. According to the Rozsa Center's Director of Programming and Development, Mary Jennings, "I feel like there is an opportunity to use IT support so that we can communicate across all of the departments [and divisions] more effectively." Currently, the Rozsa Center staff are using

Google functions, like Google Calendar and Google Drive to store and share files, yet different staff members are more or less disciplined in sharing files with each other in a timely manner - some people are very disciplined in uploading to the correct drive so that everyone has shared access, so people are very slow and require constant monitoring to make sure the proper documents are being shared. The Rozsa's Production Manager, George, feels that it would be great if there was "a calendar [software] which could also hold documents, because we are working with faculty members and [there is] disorganization [in the] file sharing [process]." Google Calendar does not have the feature to upload files or give permissions to different users.

While these problems are significant, our team identified two primary "problem areas" on which to concentrate our project efforts. First, we identified that the historical data that is currently available through the Ticket Office is not being utilized effectively. The current software used by the Ticket Office, which provides ticketing services for the Rozsa Center, is AudienceView. Consumer data is collected as part of the ticket-purchasing process and stored in the AudienceView software, but there isn't much awareness about the extent of what the software can provide, in terms of data-driven information, and there is not a formal analysis process in place for making good use of what information is available. According to the Ticket Office's manager, Ashley DeVoge, "[The software] can be frustrating because it is not very intuitive, running reports can be complicated." The functionality of the software is limited to visualization, analytics, and reporting - the software is not equipped to predict future trends. To further complicate the issue with AudienceView, neither the Rozsa Center or the Ticket Office have a designated IT staff member, which makes it difficult to explore the software and keep up with current technology trends. This lack of substantial, knowledgeable IT support limits their

ability to analyze and apply the information available in the data that is currently being collected. A designated IT person or division could also help manage customer records, sales data, market research, financial records and inventory data in a more efficient manner. Finally, the Ticket Office is that it does not exclusively serve the Rozsa Center - it is the primary ticketing resource for all events held on campus, including all athletics games, Rozsa events, and events produced by student groups - so Ashley and her team work for many clients, which makes it difficult to tailor her work to meet the needs and requests specific to the Rozsa Center.

Second, we determined that the data currently being collected by the Ticket Office and the Rozsa Center's Marketing division is severely limited. Given that a formal market survey had not been conducted since 2012, we felt that a formal, and regular process for data collection was necessary. The Rozsa Center's lack of any method or system to properly collect, manage, and make use of consumer data negatively affects their ability to make more informed business decisions or predict trends in order to strategize for the future. The most important factor in predicting trends is the consistent and regular collection data - the more data that is collected the more accurate the predictive system will be. Additionally, as new data is collected, the Rozsa Center will need a database or data center to store all of the collected data in a single place, which currently does not exist. Ideally, a system that would collect and analyze data from both Ticketing and Marketing would be optimal, as it is more difficult to use the data when Ticketing is collecting and analyzing the Rozsa Center's data differently than the Rozsa Center's Marketing division is.

Solution; Analysis of Historical Data and Predictive Modeling

An area of organization which can be improved and will give give Rozsa a competitive edge over their competitors and will also help generate more revenue, is collecting data and using that data to make predictions. The Rozsa Center can use the data they have already been collecting through the Ticket Office and analyze it to get more information, such as the experience of the customers, who are the most frequent customers, what kind of events they like and dislike, etc. In today's business environment, billions of pieces of data are generated every minute, and this treasure trove of data can be used to make meaningful inferences. Facebook and Google have become multi-billion dollar organizations by selling and showing relevant ads to people based on the data they provide. In a similar way, the Rozsa Center can also use customer data to make meaningful predictions, like whether a given person will buy tickets for a particular show or not, or which type of show should be marketed to which type of demographic area. In this era of big data, every company, big or small, should be using technologies like artificial intelligence, machine learning, and big data analytics to predict future trends from data available to them. Additionally, by using the historical customer data currently available to analyze consumer habits, such as which kind of ticket they have bought in the past, we can predict outcomes, like how valuable the customer is, and then we can make decision on the basis of the prediction to better serve the customer.

We can also identify potential customers on the basis of demographics. We can pull up the demographic data, such as the geographic location of the ticket purchaser which is provided at the point of sales, and identify people of which age group lives in that area, so that we can

market a particular genre of show in that area. Demographic information will also help up with the setting up our campaign so that we can expect more returns in revenue.

Data can be collected from many different sources - both at the point of purchase and through feedback and market surveys - and once cleaned and processed a data scientist can make computations on that data to make insightful inferences from the data. Amazon does this by using a person's browser history to show them recommend products. Organizations such as Arts and Analytics[4] provide predictive analytics software targeted to meet the needs of performing arts venues and theaters, and the Rozsa Center could look to purchase a license for such a software if their budgetary constraints were alleviated. Arts and Analytics leverages data and precision marketing techniques to enable organizations to strategically draw customers as well as to obtain donors[4]. This software is currently being used by the Denver Center for the Performing Arts, Broadway across America, and the Lyric opera of Chicago, so we can surmise that it would also serve the Rozsa Center's needs.

Solution: New Data Collection

The golden rule about marketing is **'**market where it matters'. Data science can help us identify potential customers so that we can make marketing strategies according to customer preferences. We can also prioritize and align our marketing strategies for a particular age group or people of particular demographic or psychographic. At the present, the Rozsa Center needs to acquire new customers in addition to retaining their current customers and avoiding customer loss. This means that they need to know their current customers better so they can serve them better. Analyzing historical data would not be enough as it would not be helping in acquiring

new customers. Analyzing the data about customers' likes, dislikes, experiences and other demographics and then predicting the what kind of events are more likely to cater a particular customer would certainly help in retaining customers as well as acquiring new customers. The Rozsa Center's Marketing division does not have a new data collection strategy, and the data currently being collected at the Ticket Office is not robust enough to be efficiently used, as it is not shaped as per the requirements of the prediction algorithms applied using machine learning, hence, a new marketing survey routine needs to be followed.

We believe that it would be best to survey the audience after each performance in order to collect data regarding audience preferences (in addition to the demographics and purchas-history information collected at the Ticket Office). The survey questions must be simple and easy to complete at the conclusion of a performance. The survey distribution and collection processes must also be simple and efficient if enough data is to be collected for analyzation. By asking customers provide feedback on the shows via surveys, we can then map that rating to other customers ratings.

Once this data is collected, it must be cleaned and updated into a data collection software, which, ideally, the historical data would also be stored in. This combined data should be analyzed to get different models which describe the preferences of a customers, number of customers at different types of events, the average customers at the events in a given time period, customer demographics, etc. The Rozsa Center could also optimize their ticket pricing structure according to the results of the feedback, combined with the demographic data. By using data, we can predict how much different segments of the population may be willing to pay for a ticket to a given type of show. Predictive modelling could then be applied, using the historical data as

training data and newly collected data as the test data. An algorithm will help to understand more about consumer preferences, along with how much they can afford to spend on the tickets. Combining this algorithm with machine learning, this would help the program learn by itself as and when new data is added to perform predictive analytics.

Recommendation: Analysis of Historical Data and Predictive Modeling

To begin, our team was granted access to all of the Rozsa Center's historical data available in the AudienceView software - this was the key starting point in our data analysis process. Permission to use this sensitive information was granted by the Rozsa Center's Programming Director, Mary Jennings. The data dated back to 2011, when the software was first licensed by the Ticket Office and included the following features: Customer ID (every customers has a their uniques customer ID, which is the universal identifier for each customer), street address, city, zip code, email ID, performance description, and # of tickets bought. Using the ticketing data we came up with data analytics on the historical data.

After munging the data, we decided to clean it and make it qualitative. The data cleaning was easy, as the rows had hardly null or fake values. Ultimately, we used the following pieces of information and analyzed the data based on these attributes - event name, performance description, number of tickets sold, consumer IDs, consumer zip code. We did not include personal information, like cell phone number, street address and email ID, to maintain consumer privacy. We also chose not to include redundant information like city and zip code, so we worked only with zip codes. After cleaning the data, it looks like this:

	Cust. #	City	Perf. Description	# of Tix Purchased
0	597	Chassell	1863-2013: Lincoln and Gettysburg	2
1	1569	Houghton	1863-2013: Lincoln and Gettysburg	2
2	1576	Hancock	1863-2013: Lincoln and Gettysburg	3
3	1679	Houghton	1863-2013: Lincoln and Gettysburg	2
4	1729	Hancock	1863-2013: Lincoln and Gettysburg	2

After the all data preparation was complete we performed feature engineering to find the most important features necessary for presenting the best data analysis. Using predictive modeling we explored several things; First, we identified the top cities from which the maximum number of buyers came and also the cities with the fewest sales. Knowing where the largest consumer base is located will help the Rozsa Center to better understanding where their audience base is concentrated. The Rozsa Center will also be able to target marketing efforts in those areas in order to attract more consumers to future events. They can also strategize to offer more events that the people in those cities buy the most tickets to, in order to attract larger audiences and thus generate more revenue, by just analyzing the users based on city.

City	# of Tix Purchased
Houghton	28503
Hancock	9031
Chassell	3830
Calumet	2589
South Range	1638
Dollar Bay	1405
Atlantic Mine	1255
Lake Linden	1212
Marquette	1144
L'Anse	1059

City	# of Tix Purchased
STandish	1
Charlevoix	1
Chesterton	1
Zionsville	1
Chisholm	1
Nacogdoches	1
Wyoming	1
Clyde	1
Wixom	1
Sanford	1

Second, we identified the Rozsa Center's most valuable customers based on number of tickets they bought. This is important as they can then extract more detailed information about the top *n* customers. This also can held the Rozsa Center offer events and services based on what their most frequent customers like.

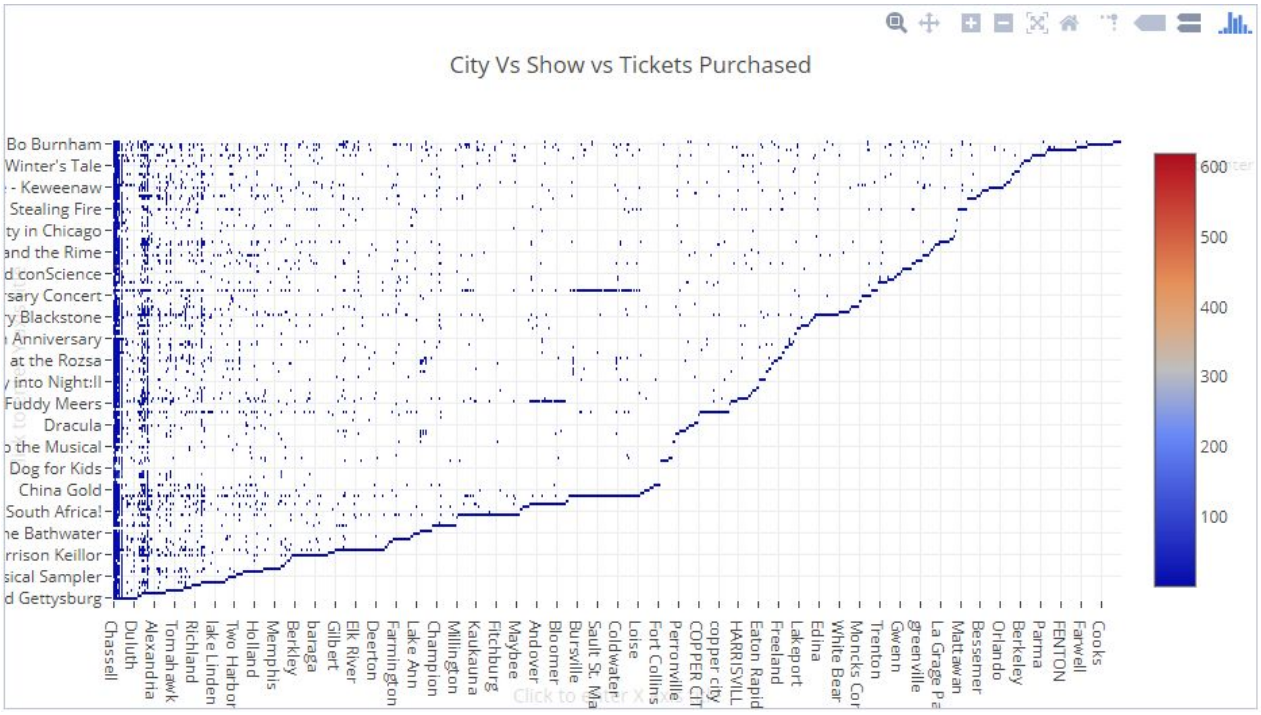
CustID	
23228	138
27118	131
1830	125
1569	113
23374	89
31632	88
29775	81
597	66
1679	64
26449	60

Third, we identified the most and least popular performances based on the number of tickets purchased for each show. The types of performances and events offered directly impacts whether the people will buy tickets or not, thus, scheduling popular performances will generate the greatest revenue. Because of this analysis, the Rozsa Center can now track their consumers' favorite show and can organize their seasons based on this information.

Perf. Description	# of Tix Purchased
Class Acts - Rainforest Reptile Show	2721
Pirate School! The Science of Pirates	2174
Class Acts - Very Hungry Catepillar	1853
Class Acts - We're Going on a Bear Hunt	1746
Minnesota Ballet, with the KSO; The Nutcracker	1710
Copper Dog for Kids	1624
Swan Lake	1347
Class Acts: Peter Rabbit	1346
Fiddler on the Roof	1337
Celtic Nights - Journey of Hope	1329

Perf. Description	# of Tix Purchased
Songs of the Earth	117
Helsinki Chamber Choir: State of the Union	113
II:Day into Night:II	110
Orchid Ensemble and conScience	105
Antigone	98
Suites!	96
Sexual Perversity in Chicago	95
Mandy Gonzales	92
4th Keweenaw Honors String Festival	90
John Luther Adams	89

Finally, we plotted a heat map to understand consumer behavior in more detail. The consumers' behavior pattern is predictable and can be analyzed more easily.



After completing several analytical tasks related to the historical data, we created a model which can predict the uncertainty. The consumer predictive model is the brain inside our project's body. We used the analysis we carried out on the historical data to develop a predictive model that can predict whether a particular current customer will like a particular future show, and whether they might buy tickets to that future show or not.

First, we made user clusters based on city, performance descriptions and customer ID with respect to number of tickets purchased. After clustering based on similar city and interest, we used the train data to build and train a random forest regressor classifier model for our predictions. We used the random forest regressor as a classifier, based on user behavior and clustered interest. We chose to use this kind of model because it is very efficient on less data, it's a very accurate classifier for sparse and odd data, and it starts in random state and converges as per data training. We trained our model on available data and tested on the last year's data, and as a result, we got a reasonably good accuracy score of 75% in the starting state on historical skewed data. We were very pleased with this outcome. Below is a code snippet:

```
reg=best.fit(Xtrain, ytrain)
training_accuracy = reg.score(Xtrain, ytrain)
test_accuracy = reg.score(Xtest, ytest)
print ("############# based on standard predict ################")
print ("R^2 on training data: %0.4f" % (training_accuracy))
print ("R^2 on test data:     %0.4f" % (test_accuracy))
```

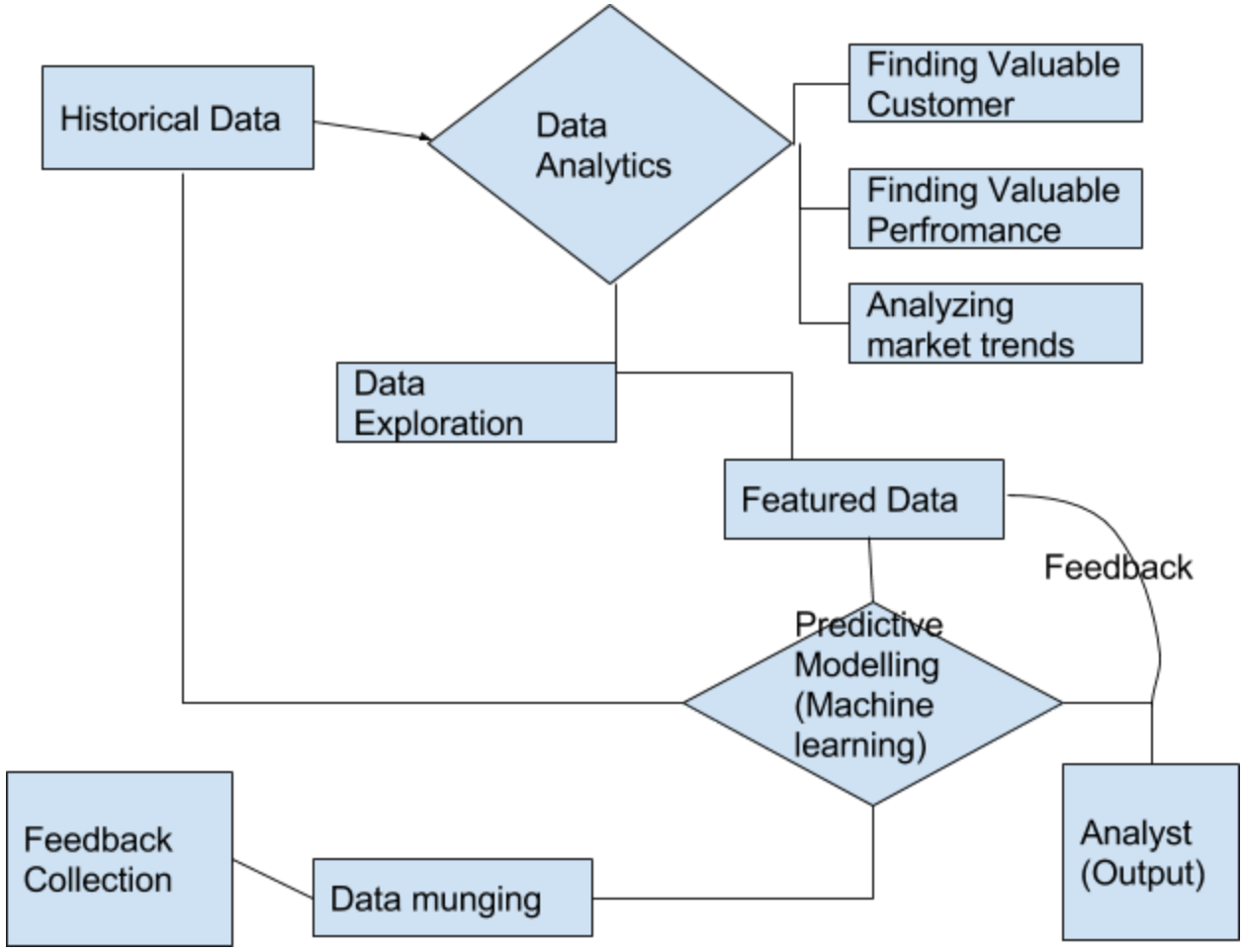
```
############# based on standard predict ################
R^2 on training data: 0.7538
R^2 on test data:     0.3105
```

Here is what the final recommendations looked like:

	Cust. #	City	Perf. Description	Will Buy?
0	597	Chassell	1863-2013: Lincoln and Gettysburg	True
1	1569	Houghton	1863-2013: Lincoln and Gettysburg	True
2	1576	Hancock	1863-2013: Lincoln and Gettysburg	True
3	1679	Houghton	1863-2013: Lincoln and Gettysburg	True
4	1729	Hancock	1863-2013: Lincoln and Gettysburg	True

After generating the probability of what that particular audience will like and attend, we simply attached that to each consumer ID for each show. The Rozsa Center can now know, using this model, which consumers will attend a given show, and in this way they can forecast the success of a future event before contracting it. We strongly recommend that the Rozsa Center uses and integrates this approach to better use the data collected by ticketing and future surveys.

To integrate this model into their operations, they would simply feed in any newly collected data to gain better results, but it would require learning a few basics about how to run this piece of code. We could even generate a more simple version of this application using integration with simple UI, or we could assist them with how to use this model for getting predictions on new data. This could be done in three basic steps: 1) Specifying the data file, 2) loading and analyzing new data, and 3) generating predictions. Ideally, anyone with computer operating skills could perform this task. These are our final presentable recommendations for the Rozsa Center to incorporate their users' analytics and behavioral predictions. The abstract model for our recommendations is below.



This machine learning model can help the Rozsa Center better manage and organize their performance seasons in advance by using this simple yet powerful mathematical model. Now that there is an established predictive model, based on the historical data, we can apply this model to the data collected in future. We can extend this prototype model for future use at Rozsa Center by adding some tweaks and transforming it into simple UI based application or integrating it with their current system. The complete technical report and recommendations are discussed in detail in data scientist's report, which can be found in the Appendix.

Recommendation: New Data Collection

The primary source of generated revenue at the Rozsa Center is the audience - the ticket buyers. Because the audience is so important in the Rozsa's revenue generation process, understanding and leveraging audience preferences has the potential to make a huge difference to the business's bottom line. The Rozsa Center does not currently collect any kind of data, they do not even have a data collection strategy, so we have recommended creating data collection mechanism for Rozsa Center's Marketing division that can be administered after every event that requires a ticket to attend. The feedback collected will provide additional data to analyze, and the analysis will answer questions related to consumer preferences, market trends and even detailed consumer characteristics of Rozsa Center patrons.

The new data will be collected in the form of a physical survey, which will be comprised of eight questions. Most of the answers will be scaled for easier data input and analysis, also people often prefer to write as little as possible, so it was important to keep the questions short and easy to answer. The following survey language and questions have been proposed to and approved by the Rozsa Center's Marketing Manager, Bethany Jones:

"Please tell us about your experience at the Rozsa Center.

1. *On a scale of 1-5, with 1 being the least satisfied and 5 being most satisfied, please rate your OVERALL OPINION of the event you saw at the Rozsa Center.*
    a. *1 - 2 - 3 - 4 - 5*
        i. *If you were not satisfied, why not? Please tell us how we can improve.*
        ii. *If you were very satisfied, why? Please tell us what you enjoyed.*
2. *How or where did you find out about the event you attended at the Rozsa Center? (select all that apply):*
    a. *1 - Television, 2 - Newspaper, 3 - Rozsa Outdoor Sign, 4 - Rozsa Website, 5 - Posters, 6 - Radio, 7 - Rozsa Calendar, 8 - Rozsa Season*

Announcement/Subscription Order Form, 9 - Rozsa emails, 10 - Friends/word of mouth, 11 - Facebook, 12 - Other

3. *How likely would you be to recommend attending an event at the Rozsa Center to a friend?*
    a. *1 (unlikely) 2 (neutral) 3 (very likely)*
4. *Did you participate in any of the following:*
    a. *Multiple choice: Pre-show event, Post-show event, concession stand, gallery*
5. *In the past, what has prevented you from attending an event at the Rozsa Center?*
    a. *(Open end)*
6. *Age*
    a. *18-14, 25-34, 25-44, 45-54, 55-64, 65-69, 70 years or older, prefer not to say*
7. *Gender*
    a. *male/female/prefer not to answer/ other*
8. *Affiliated with Michigan Tech (student/staff/faculty)*
    a. *yes/no*

This survey is voluntary, you may skip questions."

The specific language used in the survey is similar, if not identical, to questions that appeared on the 2012 Rozsa Center market survey, so the data collected from the new survey could be compared to previous survey results. The language on the survey has also been approved by Michigan Tech's the Regulatory Review Boards, Compliance, Integrity, and Safety Office Coordinator.

To administer the survey, the survey must first be registered with IRBnet.org, which is the responsibility of Marketing Manager, Bethany. Once registered, each survey will be printed on cardstock and included in the performance programs that are handed to each patron as they enter the Rozsa's main theatre. A small pencil will also be included in each program so that patrons can easily fill out the survey at the conclusion of the event they attended. Ushers will be available to collect the surveys from the audience members as they exit the theatre, and there will

also be a drop-box in the lobby that the surveys can be dropped in. The Rozsa Center's Front of House manager will also continue to experiment with the most efficient ways to collect the surveys.

Once collected, a Rozsa Center work study student will be responsible for inputting all of the collected survey results into a designated location the week following the event where the surveys were collected. This process is scheduled to be implemented beginning in the spring semester of 2018, so to start, the work study student will simply input the data into an Excel spreadsheet.

In the future, the Rozsa Center may consider implementing an email survey, which could be automatically generated and sent out to ticket buyers through the AudienceView software available through the Ticket Office. Currently, an email address is not necessary to purchase a ticket - this is why the Rozsa Center will not start implementing the surveys online, because the survey would not reach ticket buyer to a given event. In the future, the email survey could be sent out at a designated time, e.g. 5 minutes before the scheduled end time of the show. A monthly survey could also be sent out, but it would be less effective at capturing the in-the-moment feedback of a ticket-buyer's opinion of a performance. The Rozsa Center may also consider offering an incentive, such as a discount on future tickets or a gift coupon, for people who complete the online survey to encourage participation. The email survey would be comprised of the same questions included on the physical survey. After the surveys have been administered, and the data collected has been stored it can be analyzed and we can cluster consumers base based on similar interests. Similar to the historical analysis, this new data will further help the Rozsa Center understand their customers, analyze market trends, offer shows

that people would be most interested in purchasing tickets to, better understand which shows/artists generate the most ticket revenue, predict future events' success, and spend their endowed and fundraised funding on touring shows more effectively.

Recommendation: IS Software

As we know, the Ticket Office is a separate department from the Rozsa Center, yet we believe it would be in the best interest of the Rozsa Center to consolidate the data they gather from the new survey with the data available through the Ticket Office, which means that all of the data would need to be saved to a single location. The Rozsa Center could hire a database manager, on an hourly basis, to sort and store all of the collected data if a budget for such a position were approved by the university. This job could not be outsourced to a company outside of the university because the data collected from the Ticket Office contains sensitive information like patron telephone numbers, emails, and addresses. If no such budget is available (currently, it does not appear as though this is a viable option), the Rozsa Center could pay for a software license like MySQL, MongoDB, or Microsoft SQL to save data locally. Cloud storage such as Amazon Redshift, Google Big Query, or Cloudera Impala could also be considered.

We suggest working with Amazon Redshift[3] because it works well on column data and cloud storage is scalable. Currently, the Rozsa Center does not collect much data, but in the future, once more data has been collected through Ticketing and the new Marketing survey, cloud service will be helpful. Amazon Redshift will also keep data secure because data will not have to be sent out, developers will be able to run the programs directly on the updated cluster and provide insights based on that data. A database administrator could connect to this cluster

through SQL workbench to save or retrieve data, and Redshift also supports SQL queries, so working with data would not be a problem. This option is cost effective because Redshift has no up-front costs, no long-term commitments, and an on-demand pricing structure[3].

Additionally, the purchase of an SPSS license was recommended by the Rozsa Center's Marketing Manager. An SPSS software could both store and analyze the data collected from the new surveys, and would cost less than it would to hire a new employee specializing in data management. The recommended software is provided by IBM[2] and would cost the Rozsa Center approximately $1188 annually, plus the associated costs of time to set up the software and train employees on how to use it.

Conclusion

Like any business, there are many opportunities for improvement at the Rozsa Center. As a consulting team, it was our objective to determine which processes or areas of improvement we could address most efficiently, given our team's area of expertise, that would provide the company with the greatest benefit. The Rozsa Center has an abundance of data and potential data available to them because their primary business is patron-based, which is why we chose to concentrate our efforts around the data collection and analysis processes of the business. After conducting our own analysis of the historical data available through the Ticket Office, designing and testing a powerful predictive modeling prototype, and constructing a survey process that can be easily implemented to collect new data, we believe that we have provided the Rozsa Center with solutions that allow the business to operate with more agility, based on the dynamic intelligent generated from our analysis and suggestions.

References

1. http://www.mtu.edu/rozsa/about/history/
2. https://www.ibm.com/analytics/data-science/predictive-analytics/spss-statistical-software
3. https://aws.amazon.com/redshift/
4. https://artsandanalytics.com/

Appendix (see attachments)