# PREDICTIVE ANALYTICS IMPROVES THE (FINANCIAL) PERFORMANCE OF THE CINCINNATI SHAKESPEARE COMPANY

ALEXANDRIA, VA, MAY 7, 2015 – A new predictive analytics tool developed by the statistics department of the Miami University of Ohio is helping to boost the financial performance of the Cincinnati Shakespeare Company while introducing more of the city's residents to some old classics.

The theater's experience and the development of the analytics tool is relayed in an article—"Statistics and Show Business: Shakespeare Meets Predictive Analytics"—in the April issue of *CHANCE* magazine, which is published by the American Statistical Association.

This story has similarities to the experience of the Oakland Athletics baseball team, which employed predictive analytics to field a winning team, a feat glorified in the movie Moneyball. In the case of the Cincinnati Shakespeare Company, also known as Cincy Shakes, the objectives were to turn data into predictions and use those predictions to drive key decision-making such as reallocating marketing resources to boost ticket sales.

The predictive model—developed by Byran Smucker, assistant professor in the Miami University of Ohio Department of Statistics, and former graduate student Xinping Zhang—enables the theater company to fulfill both objectives.

Cincy Shakes is a professional theater company focused on performances of Shakespeare and the classics. More than 25,000 tickets are sold annually to 10 productions, each with a typical run of 16 to 20 performances. As a small nonprofit, income from ticket sales—or earned revenue—is about 50% of its business, yet it is the least predictable revenue stream. Theater Executive Director Jay Woffington turned to Miami University to develop a predictive analytics tool that would greatly enhance decision-making and help make ticket sales and revenues more predictable.

Before the development of the predictive model, Cincy Shakes relied on educated guesses based on sales trends, institutional knowledge and learned heuristics. Its resulting "organizational gut" went like this: "If we hit 20% of goal before our first performance, we will make the goal." Not only was this rule of thumb incorrect about half the time, there was no time for the company's staff to ramp up marketing activities if a show did not achieve the "gut" benchmark. The result was empty seats and lost revenues—something the theater could not afford.

Over a year and a half, the team built the predictive analytics model around comprehensive sales data for 40 show performances spanning four of the theater's seasons—2010-11 to 2013-14. The tool enables the theater to track a show's ticket sales and momentum. "Rather than just looking at sales to date, Byran and Xinping were

able to create a momentum input. Measuring momentum is easy, but knowing its impact is harder. For example, a show with $3,000 of sales that hasn't sold a ticket in a month is in a very different place than a show with $3,000 of sales that sold $1,000 of that total yesterday and $1,000 more the day before! In a way, it's the quantification of a show's buzz factor and that's pretty neat," explained Woffington.

The predictive analytics tool offers the following functions to support Cincy Shakes' decision-making:

1. Construct a visualization that traces the trajectory of ticket sales for any particular show, whether complete or in progress
2. Review retrospective predictions for all completed shows in the database
3. Make a prediction of the total sales for all incomplete shows based on ticket sales information in the database
4. Make a prediction for any show within 60 days of opening based on user-entered ticket sales information (this is perhaps the most important functionality because it allows the theater to reallocate limited marketing resources)
5. Make a prediction for a generic show (this function empowers the theater staff to select shows to feature in the upcoming season)

The predictive model works exactly as planned. For instance, in March 2014, two shows remained in the theater's season: "Two Noble Kinsmen" and "Private Lives." The question facing Woffington and the theater's box office manager was where to invest remaining marketing dollars. Applying the formerly used data-less rule of thumb, "Two Noble Kinsmen" appeared to be lagging and "Private Lives" was on track. However, the new predictive model projected "Two Noble Kinsmen" would meet goal while "Private Lives" was trailing its goal significantly. Heeding the predictive model's analysis, theater staff decided to invest more resources in marketing "Private Lives." As a result, that show's momentum was boosted and both shows ended up exceeding goal.

"We are now able to get a better picture of how our sales are doing at any given point," said Woffington while describing the theater's experience using the predictive analytics model. "We know how well a show three to four months away is selling based on sales to date and the past seven days of sales. This information helped us decide to stop marketing a show even though it was only 10% toward its budgeted goal because we knew it would surpass goal. And, we have decided to increase marketing on a show that appeared good to the naked eye, but was in trouble. It's a win-win-win for us: we save money, reinvest resources in the show that needs additional marketing and drive additional revenue."

In the *CHANCE* article, Smucker said Cincy Shakes can use the predictive analytics tool to make principled predictions and therefore make appropriate actions. "Now, the actor can know when his presence and performance are inspiring both awe and healthy ticket sales, the theater's board members don't freak out except for very good reason and the box office manager doesn't spend money on marketing unless the data call for it," he explained.

Woffington, who has a background in business and experience using analytics, offered the following advice to leaders of other performance-based organizations considering a predictive analytics program: "You have the data; use it. If good is the enemy of great, great is the enemy of done. Too often, data seems daunting. It has to

be perfect or it's not worth it. That's just not true," he said. "Having better insight into what is happening in your business is valuable because it helps you make better decisions. So I always advise people to 'just start'; getting something in market is better than nothing."

**Note to Reporters and Editors:** For a copy of the *CHANCE* article, send an email to [jeffrey@amstat.org](mailto:jeffrey@amstat.org) with "Stats & Shakespeare" in the subject line.

### *About the American Statistical Association*

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