



Data Utilization of Digital Directory Kiosk to Enhance Customers' Experiences in American Shopping Malls

Anirudh Buchalli, Arun Ramakrishnan, Roli Gupta, Pranay M. Khandelwal, Yizhu Liao, Matthew A. Lanham
Purdue University Krannert School of Management

Abstract

Focus of study is to utilize data from **digital directory ("kiosks")** to develop business strategy across three phases of shopping mall development:



Before Mall Opening

Estimate the number of kiosks need in a new mall using Linear Regression



During Mall Opening

Develop customer journey to understand interactions with the kiosks and engender customized advertisement



Maturity Stage

Flag kiosks requiring maintenance using time series forecasting

To withstand the growing E-commerce industry and improve customer experience, **harnessing data-power** will help companies maintain their competitive advantage. Our solution delivers the metrics for usage and analysis, which can **enhance customer experience**, generate incremental revenue from advertising, and display accurate **information about events and deals in malls**.

Introduction

With the boon in E-commerce, **customers have changed** the focus of mall experiences. Companies, in turn, have put efforts on enhancing customer's **shopping experience** through utilizing kiosks, which help mall shoppers find stores efficiently, highlight special deals or events and **display advertisements**. With the data gathering from kiosks, shopping malls can better analyze the **customer journey**, the customer engagement with the content and the effectiveness of advertisements.

Research questions need to be answered for continued company growth:

1. How many kiosks needed within a new mall?
2. How do customers interact with kiosks inside of shopping malls?
3. How can a mall better utilize and maintain kiosks?

Literature Review



Customer journey mapping in high street retail instead of malls

Analyzing data from smartphones and WI-FI



The analysis of digital directory on mobile device instead of kiosks

Analytics-driven Dynamix Visualization (AVDD) on digital directory



The impact of targeted advertising on shoppers in malls

Analyzing data from Wireless Local Area Network (WLAN)



Customers' emotional reactions toward the mall kiosks

Implementation of a between-subjects design

Acknowledgements

We thank Professor Matthew Lanham for constant guidance on this project.

Methodology, Results and Conclusion

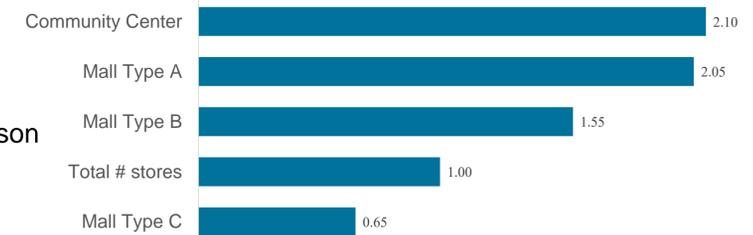
How many kiosks needed within a new mall?

$$\gamma(\text{no of kiosks}) = \text{exponential function}(\text{Total \# stores, Community Center, Malls, Mills and Premium Outlet})$$

To identify variables that can help better estimate the number of kiosks for new malls. A Poisson regression model was chosen as the dependent variable was discrete counts.

Model MAPE(mean absolute % error) was **~30%**, indicating the model is stable and is successful in explaining majority of the variance in the number of kiosks across all malls.

Variable Importance



Inference- Total # of stores and the category of malls are the most significant

Before

Customer Pathways

Use Sankey diagram, to visualize the pathways taken by individual customers to reach their desired stores

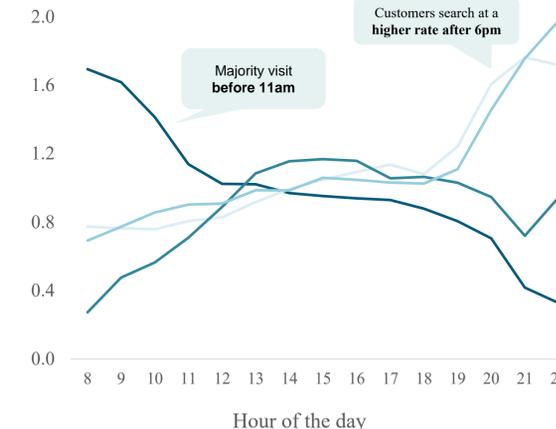


Specific paths that majority of customers take

During

Tailored Screen Advertisement

Based on time of the search, identify optimal time for screen advertisements of different shops



Different shops are viewed at different times of the day. Ads for shop A (dark blue) needs to be shown in morning while that of shop B (light blue) in evening

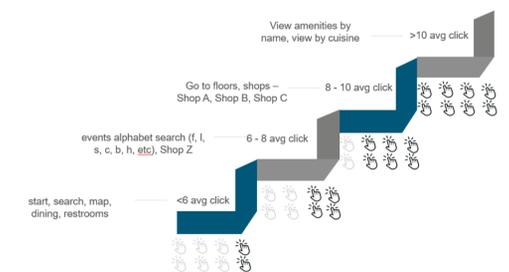
Screen Utilization

Screen utilization = total number of screen clicks divided by number of hours of usage per year

Malls	Utilization-Variance	Comments
Mall A	16.4	Devices not placed optimally
Mall B	3.8	Devices placed appropriately
Mall C	4.2	Devices placed appropriately

Clicks to reach a category

At overall level, each session has an average of 8.6 clicks and median of 6 clicks



Time-series forecasting

Flag kiosks requiring maintenance - Predict screen usage within next hour and compare it with actual. Usage +-25% of the predicted value will generate real time trigger to business units. Headquarters can direct the teams across US on potential kiosks that require maintenance therefore rectifying before it has customer impact.

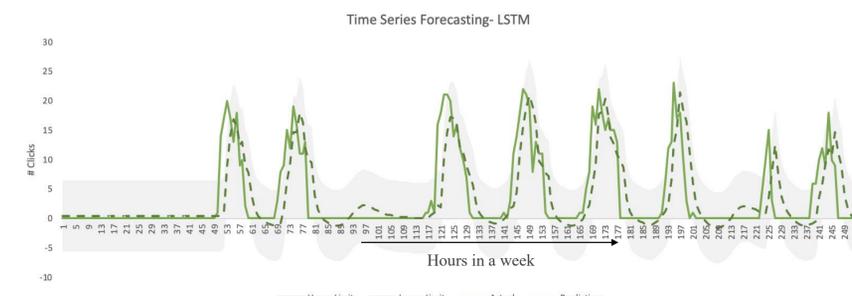
Modeling approaches

- Tried multiple approaches to forecast
- Hourly data points used to model

LSTM Model details

- Best results with lookback of 1-week, Exogenous features viz holidays and days when mall was closed also consider
- If the real number of clicks does not lie within a specified range of this estimate, then that kiosk will be flagged for maintenance.

Model	RMSE
LSTM	1.78
Prophet - Facebook	2.13
XGBoost	2.26



Maturity