Can interactive data visualizations enable a retailer to identify new insights about customer purchase behaviour?

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Project Background

Consumer behaviour in the retail industry is changing due to the rise in convenience and multi-channel retailing. In response to these changes, and to better understand the types of shopping missions undertaken by customers, Sainsbury's has developed a four-tier classification system of shopping baskets. Through surveys and predictive clustering, Sainsbury's has developed an algorithm that assigns each transaction into one of four mission types: 1) "Food for Now;" 2) "Food for Later Today/Tonight;" 3) "Food for Tomorrow/A Couple of Days;" and 4) "Food for Many Days." Through this project, Sainsbury's sought the development of interactive visualization(s) to better understand the trends regarding these four mission types in order to make decisions regarding store layout and planning.

Data and Methods

This research used the Design Study Methodology (DSM) to guide the process of eliciting requirements, and designing, building, and implementing interactive visualizations. The visualizations use visual data mining techniques to enable users to identify trends in a complex transaction dataset and were built on Processing, a Java-based open-source platform, according to the Incremental Development methodology. The DECIDE Framework was used to guide an evaluation session with three unique participants, who completed timed tasks using the visualizations and questionnaires rating the effectiveness and efficiency of the visualizations to address two main tasks. These tasks were: 1) Determine how mission type percentages from one category and week compare to another category and/or week within the dataset; and 2) Determine how mission type percentages differ by category, time of day, weekend vs. weekday, or week within the dataset.

Key Findings

Two visualizations were created through the project. Visualization #1 includes two side-by-side donut charts displaying mission type percentages for a given category and/or week. A line graph depicts the overall trend of the mission types for each selected category at the bottom of the visual and serves as a tool for users to select a given week. Visualization #2 displays circles whose area corresponds to the number of each type of transactions for each mission type per hour, color-coded for weekends and weekdays, for a given category and/or week.
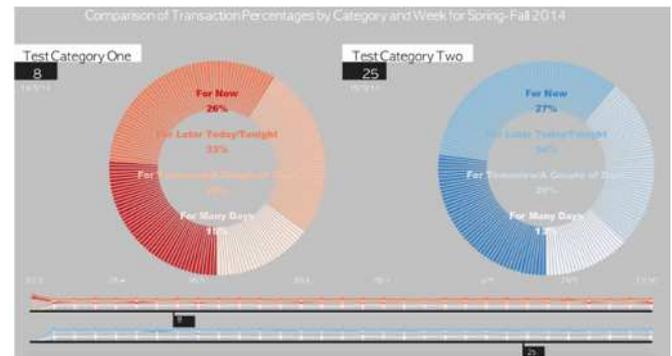

Figure 1. A demonstration of Visualization #1

The results from the evaluation of the two visualizations were very promising. Each of the three participants specified that he/she "strongly agreed" or "agreed" that the tasks were relevant to his/her role and responded that he/she "strongly agreed" or "agreed" that both visualizations were effective and efficient in addressing the two tasks. Each participant specified at least one new learning, a question, and a hypothesis that could be answered for each visualization. Additionally, each participant specified that he/she would use Visualization #1 to do his/her job.

Value of the Research

The evaluation results suggest that the visualizations created could help Sainsbury's identify new insights into customer behaviour, which may help for planning purposes within existing stores, or to make forecasting decisions to expand, downsize, open, or close stores. The evaluation discussions suggested potential improvements that could be made and additional features that could be added to better address these tasks or other needs of the organization. This project may lead to more interactive visualizations using visual data mining being used at Sainsbury's and other supermarkets or retailers to drive decision-making behaviour.