

## What factors cause long transaction times at self-service checkouts?

Alex Schwarz<sup>1</sup>, Aidan Slingsby<sup>1</sup>, Kim Cassidy<sup>2</sup>, Chris Harrison<sup>3</sup> and Andrew Carmichael<sup>3</sup>  
<sup>1</sup>City University, <sup>2</sup>Edge Hill University, <sup>3</sup>Marks and Spencers

### Project Background

The rollout of self-service checkout machines in the early 2000s has enabled many retailers in the UK to streamline business processes whilst simultaneously increasing customer satisfaction. While, for the most part, this has been a successful endeavour, there is still a high variability in the efficiency – in particular transaction times and costs – of self-service transactions across different stores, products and customer groups. Therefore, retailers try to identify efficiency potentials by looking at factors that cause long transaction times and by providing a retail setting that minimises costs associated with the set-up of different self-checkout machines.

### Data and Methods

To achieve this, a visual analytics approach has been applied to a large volume dataset covering transactional data from all M&S operated stores in the UK with approximately 190 million entries for the months January to June 2018. The term 'visual analytics' describes an exploratory, iterative data analysis method that combines the strengths of humans and computers when processing large datasets. By combining data mining techniques with interactive visualisations, it facilitates effective communication between various stakeholders and enables knowledge discovery. This iterative approach mainly compromises data processing, pattern recognition through high level visualisations and subsequent interviews with business representatives. The outcome of this approach was that specific groups of products and an inefficient allocation of till and basket types are main contributors to long transaction times. Therefore, the analysis was divided into two parts: descriptive statistics of time critical products and a model that tries to harmonise capacity and demand at self-checkouts to minimise transaction times and save costs. The latter is based on a simple assumption: transaction times across all stores in the UK can be significantly reduced if there is a match between basket types (scannable items only vs. baskets including weighed items) and types of self-checkout machines (tills with a scale versus tills without a scale). In particular, it is efficient if baskets with scannable items only ('fast baskets') are scanned at tills without a scale ('fast tills'). This is because fast tills allow for fast processing of fast baskets (card payment only), are less expensive and customers with non-scannable items are less likely to be blocked by customers using the 'wrong' self-checkout machine.

### Key Findings

The results of the product analysis provide empirical evidence for products that cause long transaction times which have so far only been identified as critical on a heuristic, non-data basis: bakery products, loose vegetables and fruits. Moreover, it demonstrates that the handling of promotional vouchers and other temporary items such as Christmas or Easter products is currently not time efficient.

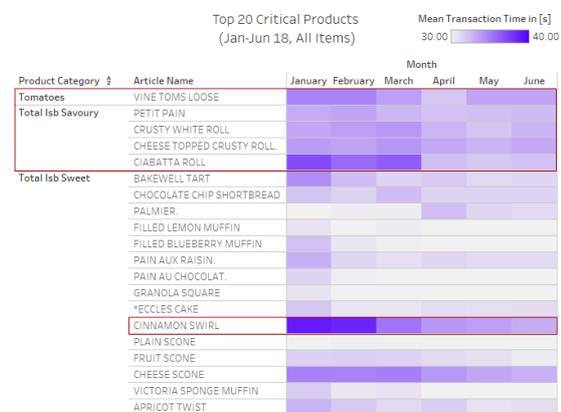


Figure 1: overview of time critical products (January to June 2018)

The results of the capacity-demand analysis demonstrate that inefficiencies at self-service checkouts may either be caused by the retailer or the customer. Inefficiencies caused by the retailer mainly come from two sources: excessive over- or undercapacity of tills. Inefficiencies caused by the customer arise when capacities for fast baskets are existent and available, but customers decide to till their fast baskets at slow tills. Based on these findings, M&S should harmonise demand and capacity for fast baskets in each store through efficient reallocation of tills between stores (no new investments required). Moreover, customers should be sensitised for the benefits of fast tills when tilling fast baskets (reduced transaction time).

### Value of the Research

Given the current climate in grocery retail (significant cost pressures, new players entering the market such as Amazon Food), retailers are under pressure to improve business operations to save costs and increase the level of service offered to customers. This research provides a practical big data approach that allows to identify contributors to slow business processes (time critical products) and inefficient store settings (match of till and basket types).