

Self-Checkout vs Cashier Checkout at Meijer by WSU

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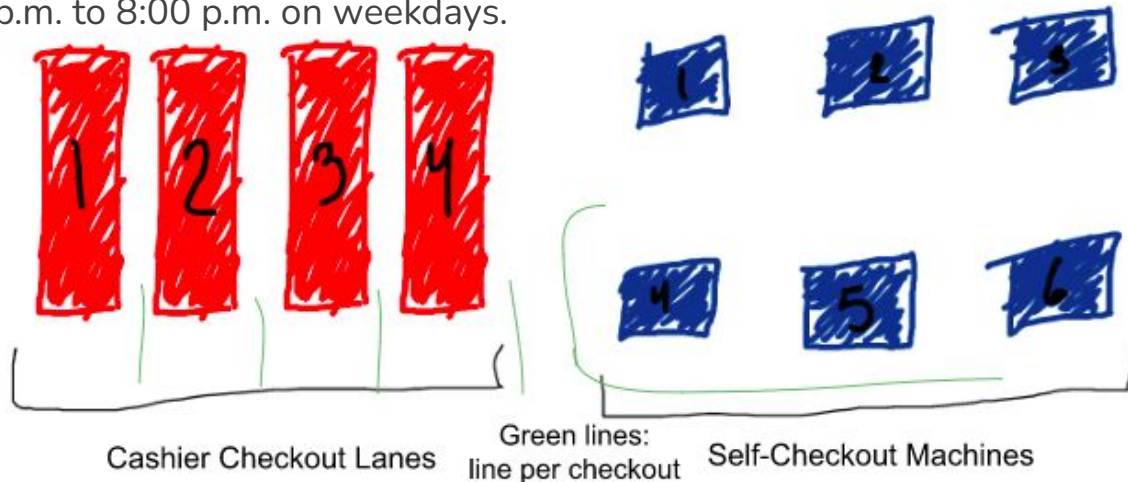


Question: Self-Checkout or Cashier?

- At the Meijer by Wright State University, is it quicker to checkout with a cashier or is it quicker to checkout with a self-checkout machine?
- According to online sources, some say self-checkout only feels faster since the customer themselves are doing the work, not waiting [1]
- According to other online sources, self-checkout is faster, but is that because of actual checkout time, or based on how long you wait in line [2]?
- Only researching actual checkout time, not time waiting in line

Real System

- Cashier-run checkout lanes (more than just 4 pictured, however only 4 were in use at the time)
- Self-checkout machines: one line for all 6 registers.
 - 1 or 2 employees available for assistance
- Data collected from 6:00 p.m. to 8:00 p.m. on weekdays.





Simulation Model

- Follows real-world system
- Minor tweaks and assumptions
- mPerks (Meijer's Rewards System)
- Getting Assistance in Self-checkout
 - Wait for assistance, get assistance
- Cashier sometimes needs assistance
 - Only happened twice, ignored

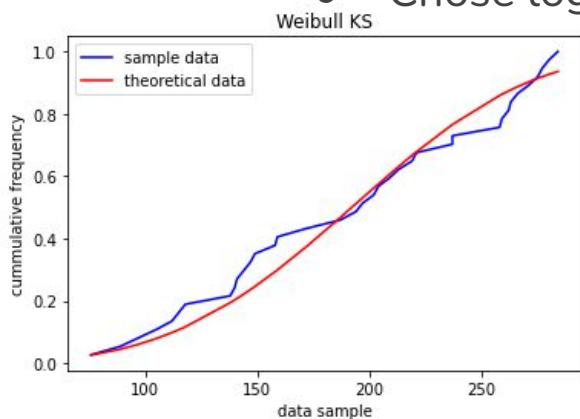
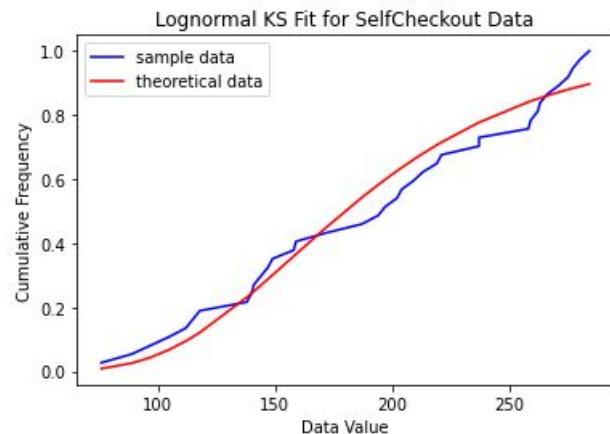


Simulation

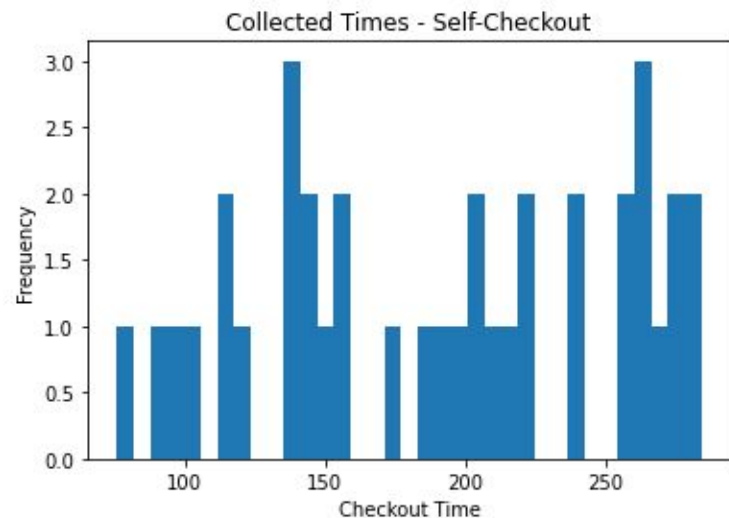
- Runs 2 Scenarios, Self-Checkout and Cashier Checkout
- Customers arrive with a random exponential variate of 3 minutes (180 seconds)
- Simulation uses seconds, rather than minutes and seconds to run
- Both have a random chance of having mPerks
 - (extra 15 seconds to checkout!)
- Only Self-Checkout has an assistance variable
 - Waiting for Assistance Mean: 21.2 seconds
 - Getting Assistance Mean: 20.5
 - Really depends on how busy employee at self-service is, waiting can be 5 seconds or almost a minute

Analysis of Data - Self C.O.

- Tested goodness of fit with Chi-Squared and Kolmogorov-Smirnov (K-S) tests.
- Theoretical Distributions tested: Exponential, Lognormal, Weibull, Gamma, and Uniform.
 - Empirical?
- Chose lognormal distributions for both

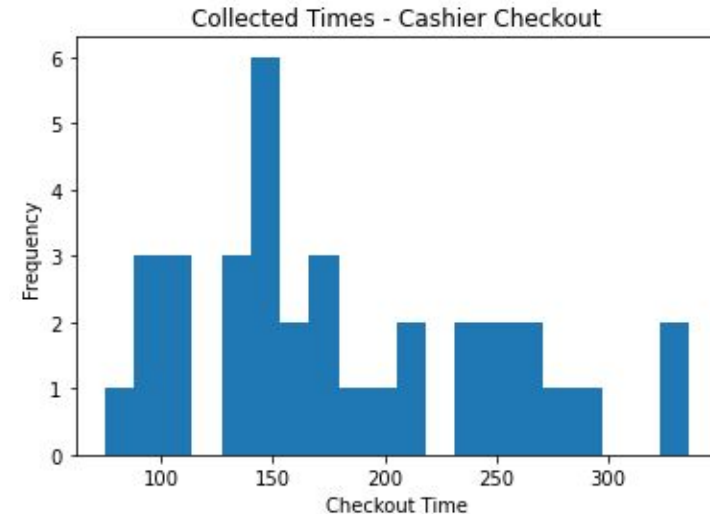
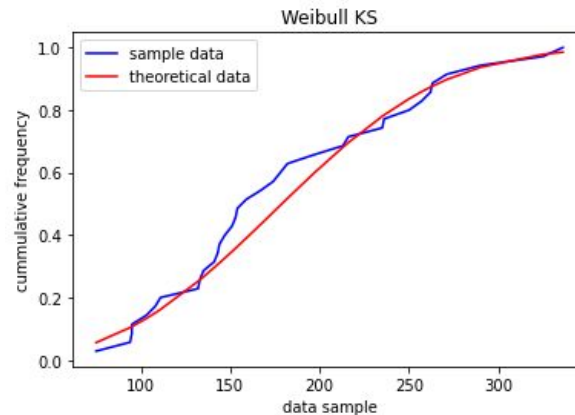
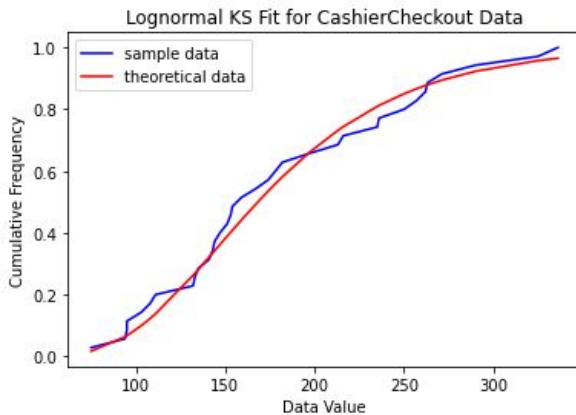


Not a lot of data points collected compared to simulation



Analysis of Data - Cashier Checkout

- Both have lognormal distributions.
- Tested goodness of fit with Chi-Squared and Kolmogorov-Smirnov (K-S) tests.
- Theoretical Distributions tested: Exponential, Lognormal, Weibull, Gamma.

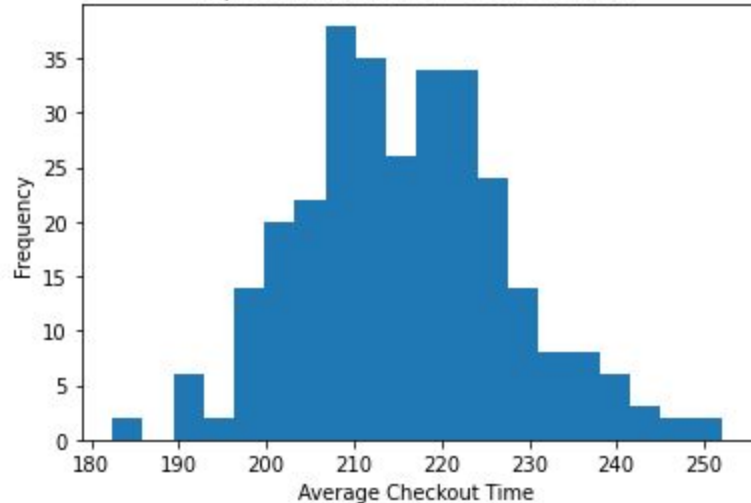




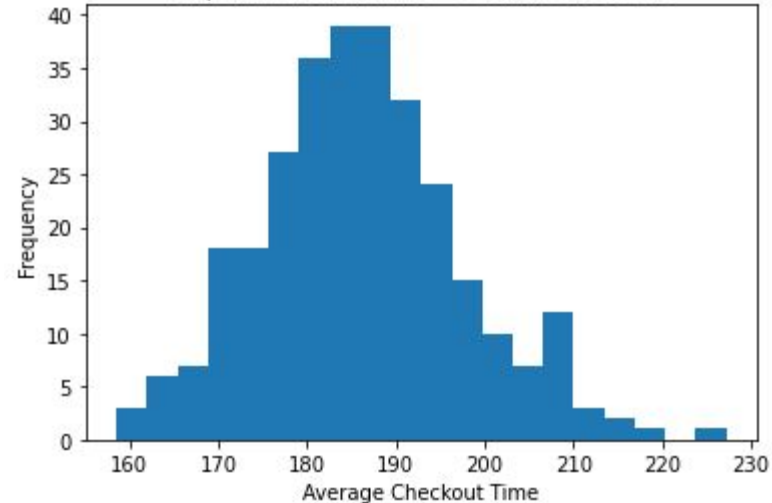
Results

- Had much more data to go off of for the simulation than the collected data
- Checkout time in seconds

Experimental Results - Self-Checkout



Experimental Results - Cashier Checkout





Results (Cont.)

Data-Type	Collected Mean	Collected STD	# of Collected Samples
Self-Checkout	191.216	7.884	38
Cashier Checkout	180.714	8.254	36

Table 1: Real System Collected Data, in seconds, Mean and STD.

Data-Type	Simulated Mean	Simulated STD	Minimum Mean	Maximum Mean	# of Simulated Samples
Self-Checkout	214.702	6.981	182.344	257.251	12039
Cashier Checkout	187.165	7.241	154.709	220.621	12024

Table 2: Simulation System Collected Data, in seconds, Mean and STD.



Results - Confidence Intervals

DataSet	95% Confidence Interval	99% Confidence Interval
Self-Checkout Collected	170.911s to 211.521s	164.531s to 217.901s
Self-Checkout Simulated	191.394s to 238.0098s	184.0703s to 245.334s
Cashier Checkout Collected	170.911s to 211.521s	164.531s to 217.901s
Cashier Checkout Simulated	164.887s to 209.443s	157.887s to 216.443s

Table 3: Collected Data and Simulated Data Confidence Interval Results, in seconds



Conclusion

- Based on the project, checking out with a cashier, not waiting in line included, is faster.
- However...
 - It really just depends on the situation
 - Is the cashier new?
 - Is there a line?
 - Cashier line - only 1 checkout space
 - Self-Checkout line - line for 6 machines

THANK YOU!

Questions?

Sources on next slide





Sources

1. Strong Point. (2017, November 20). *The self-checkout paradox – faster or slower?* iXtenso.
Retrieved November 29, 2022, from
<https://ixtenso.com/technology/the-self-checkout-paradox-faster-or-slower.html>.
2. Schmidt-Jacobsen, T. (2020, October 13). *Advantages and disadvantages of 6 retail self-checkout systems*. Sprinting Retail. Retrieved November 29, 2022, from
<https://sprintingretail.com/blog/retail-self-checkout-systems/#:~:text=Since%20self%2Dchecko,ut%20is%20typically,comes%20to%20cost%20of%20space>.