The effect of effective communication on the MTA subway efficiency

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ABSTRACT

The MTA (The Metropolitan Transportation Authority) Subways are congested and late. The signals are outdated, there are minimal tracks, and the subway cars are ancient. People in New York City are late to their jobs and schools because of the inefficient system that the MTA has. Time is important. Technology is improving worldwide and the MTA should not be an exception. New technologies can be used in the subway. In the modern day the MTA subways still use signals (green go lights and red stop lights) that often lead to miscommunication in the tunnels and inefficient travel. As a result, there are larger crowds on the platforms, unsatisfied customers, unpleasant rides, and ultimately an inconsistent system. This experiment will closely examine the effect of more efficient communication between trains in the subway system. The experiment will determine if a greater communication system will increase the efficiency of time between trains. The implementation of new technology, VTBC system, will make the MTA subway ride better. This test will also look into the correlation between a better communication system to better train traffic flow. This change will benefit the customers and the system the MTA is currently using. The overall consensus of customers felt that the implementation of the VTBC system was better than the normal MTA system. The customer satisfaction averaged around two out of ten for the old MTA system. After the implementation of the VTBC system the customer satisfaction rates went up to a nine out of ten.

INTRODUCTION

The problem that every MTA customer has is the congested subway. The rapid urbanization of New York City is leading to higher demands for a more efficient subway system. As the most frequently used resource for transportation, the MTA has to transport over 5 million people per week (Introduction to Subway Ridership, 2018) in a city of billions. With the current MTA communication system being outdated and inefficient, daily riders of the subways are late to their personal lives. The MTA has to constantly fix the communication between conductors every day. As a result, the train is delayed and the time of the next train is unknown. The MTA is supposed to get passengers to their location in the most efficient way possible. If we implement this technology into the subway trains then we could have a more efficient subway system.

Currently, the MTA is using the signaling system that was installed when the first subway line opened in 1904 (Gordon, 2017). Even though the MTA released an app for train times, there is still room for improvements. Transportation systems like the MTA, that are large scale infrastructures, need to be constantly monitored and under construction. The MTA needs a new system like VTBC. VTBC (vehicle-to-vehicle based train communication) can change the old subway system. VTBC can decrease the number of pieces of wayside equipment and improve the efficiency of real-time system communication (Feng, 2018). The system is designed to improve train automotive control, reduce system coupling for better efficiency, and lower cost (Feng, 2018). Results have shown that VTBC is an efficient method and assists in punctuality between trains. This experiment will be done over the course of the next year.

MATERIALS AND METHOD

Materials

- Timer
- VTBC system
- Recording devices
- Monitoring devices

Method

Before doing the actual experiment, I have to get data before the new system is implemented. Getting data before the new factor is included is crucial to see the difference in arrival times. The setting for this lab is in multiple subway stations in Manhattan, New York City. This would be the control group of the experiment. The constant setting of subways in New York and the train arrival times without the implementation of the new system. This would also reduce the chances of finding any errors in the final data. Also recording customer feedback can prove the effectiveness of the experiment. After recording the constant group, the new technology can be implemented into the experiment. There will be three runs for the old MTA system.

I then implemented the VBTC. The VBTC is comprised of 5 pieces: central ITS (intelligent train supervision system), TMC (train management center), OC (object controller) belonging to wayside systems, IVOBC (intelligent vehicle on board controller) installed in

vehicle, and DCS (data communication system), which provides data transmission link between static equipment and moving train (Feng, 2018).

TABLE 1: Comparison between VBTC and CBTC system.

Property	VBTC	CBTC
System components	Central ITS TMC IVOBC DCS OC	Central ATS (automatic train supervision) DSU (digital storage unit) VOBC (vehicle on board controller) DCS ZC (zone controller) CI (computer interlocking)
Train to train communication mode	Direct radio communication between trains	Indirect communication between trains, interactive information needs to be relayed by wayside equipment
Train control mode	IVOBC is center of system, ground only provides auxiliary functions, such as schedule plan, emergency procedure	Train operation is controlled by ATP from ground and vehicle
Wayside equipment	Little wayside equipment, only balises, switch controller	Amount of axle counting, balises, semaphores
Daily maintenance	less maintenance data mainly involving of train	Amount of maintenance data including train, wayside equipment

Figure 1 shows parts and functions of the components in VBTC

Central ITS is in charge of train operation schedule, monitoring all the conditions of other systems, and processing safety related events (Feng, 2018). The trains in this experiment should periodically communicate with the Central ITS. Then the Central ITS will provide information of what trains are in the area safely. TMC will store and distribute the given data. This data can include electronic map, system configuration data, and temporary speed limits (Feng, 2018). OC is the control unit. It collects and sends the status of the control (train arrival/ departure time) in response to requests of trains and central ITS (Feng, 2018). IVOBC develops new functions of route plan, route safety protection, and moving authority calculation. DCS links the systems all together. In this experiment the DCS will communicate in the form of LTE. Test runs of this program will be done to eliminate any possible error in the experiment. Then, update the system and run this new VBTC program. After the new system is implemented, record arrival times of

the new program to see the difference between the two groups after three trials. Finally, record the customer feedback.

RESULTS AND DISCUSSION

Results

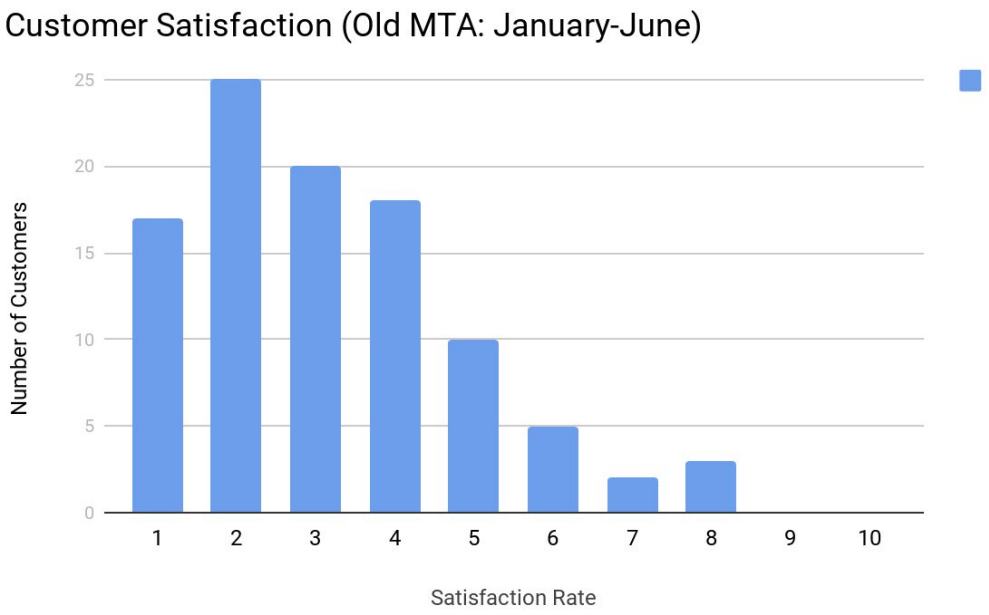

Figure 2 shows the satisfaction of the customers with the current MTA subway.

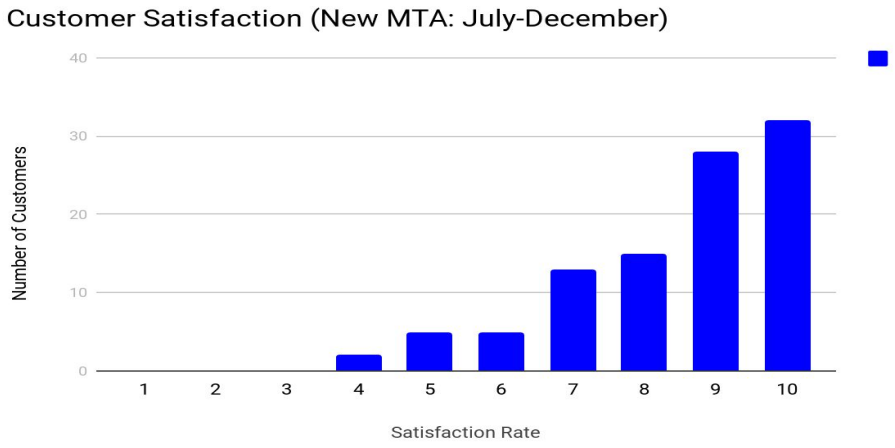

Figure 3 shows the satisfaction of customers with the implementation of the new MTA system

Discussion

The current MTA system had mostly low scores averaging a score of two out of ten. This shows that the customers were unsatisfied with their ride on the MTA. Also the trains were not on time and experienced a lot of delay between trains. Many customers have also complained about the inaccuracy of the train arrival time.

The implementation of the new VTBC system immensely improved the traffic between train cars. It decreased the congestion on the platforms of the tested stations. There were no delays between the trains and the trains came around the same time it was said to arrive. The customers rated this new system ten out of ten and were extremely satisfied with their commute. The new technology is currently being tested and implemented into the rest of the New York City train stations.

CONCLUSION

Overall, the experiment reached a conclusion that a more effective communication system increases the efficiency of the MTA subway systems. Implementing this new VTBC system into the MTA subways decreased delays, traffic, and congested platforms. It certainly satisfied the customers of the MTA and made their commutes delightful. The VTBC system consistently made the trains arrive on time to the stations, and minimized even the slightest delays. Some weaknesses of this experiment is that the experimental group was small. If there are more experiments with more customers then there would be more data to write about. Also a year might not be enough data to identify possible errors that could happen in the future. In the end, the results of this experiment were satisfactory, and it will help set an example to create an efficient transit system in the future.

Final Quantitative Data: Customer Satisfaction from 1 - 10 out of 200 customers

	1	2	3	4	5	6	7	8	9	10
Test 1 Customers (Old System)	17	25	20	18	10	5	2	3	0	0
Test 2 Customers (New System)	0	0	0	2	5	5	13	15	28	32
Total: 200	17	25	20	20	15	10	15	18	28	32

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2) Gordon, Aaron. “Meet the Century-Old Technology That Is Causing Your Subway Delays”. (n.d.). Retrieved from https://www.villagevoice.com/2017/09/07/meet-the-century-old-technology-that-is-causing-your-subway-delays/

3) Introduction to Subway Ridership. (n.d.). Retrieved from http://web.mta.info/nyct/facts/ridership/

Reflection

For this assignment, the target audience are the people who ride the MTA (Metropolitan Transportation Authority) and subway daily. The amount of people that ride the subway is large, so this assignment is an external lab report. An external lab report contains a list of materials, methods, results, and discussions. The purpose of a lab report is for its credibility for future research, so it is required that a lab report be formal. That is why the materials and methods need to be thorough. It has to explain the method properly in order for anyone to replicate the lab.

The exigence of this lab report is the MTA subway system. The modern subways are outdated. People are constantly late to their jobs and schools because of subway delays. It is crucial that the subway is constantly undergoing maintenance in order for the trains to move more efficiently. It is important that the customers are informed of what kind of system the MTA is using and why their trains are late all the time. They should also know that there is room for improvement for the MTA. This lab shows how and what can be changed for a more efficient MTA transit system. The purpose of this lab report is that like many other people, I have a personal problem with this topic. These trains are always late and slow. I have had many experiences with the subway that led to me being late for my morning classes. Every time I rode the subway I thought about ways that this transit system can be improved. That is why I believe that sharing the information that I have researched is important for all the New Yorkers that live in the city that have the same problems with the MTA. The constant inaccurate times and

grueling delays are frustrating. That is why this research needs to be shared, so that more research in New York can go into improving the MTA subway transit system.

My attitude towards the MTA is that it can be significantly improved. It is very difficult to improve a large scale project like the MTA because of its size and influence over New York City. However, the current MTA system is outdated and needs a lot of improvements. One improvement the MTA needs to make is the communication between trains. If the MTA is able to improve the communication in the underground subway then the MTA can look to make other changes. If the MTA are able to improve the small things in the MTA instead of working on one big project, then the outcome is much greater.

Throughout this assignment, I have met most course learning outcomes. Points 1, 2, 5, and 8 were met in the lab report. In this assignment I was able to research my topic and revise my lab report. To properly write this assignment, I had to carefully read and research articles on the topic of my choice. Some of the vocabulary was hard to understand, so I had to paraphrase some of the writing to fit the vocabulary of the audience. In this case a New York City citizen. I organized the lab report so that it is easy to look at. I included things like the table of contents so the reader knows where to look for the information they need. Also I put in graphics of the data and illustrations so that the audience can easily understand what the outcomes of the lab means. Citing my sources in APA format was an important part of the lab report. This is because people can see where my information came from and how credible my lab is. It also proves how I came to my conclusions in my lab report.