Customer Service at MVD Field Offices

FINAL REPORT 544

June 2008

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in cooperation with
U.S. Department of Transportation
Federal Highway Administration

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Technical Report Documentation Page

1. Report No. FHWA-AZ-08-544	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle **Customer Service at MVD Field Offices**		5. Report Date June 2008 6. Performing Organization Code
7. Authors Ian Tingen, David Lovis-McMahon		8. Performing Organization Report No.
9. Performing Organization Name and Address Ian Tingen, David Lovis-McMahon 1050 S Stanley #156, Tempe, AZ, 85281		10. Work Unit No. 11. Contract or Grant No. SPR-PL-1(59)544
12. Sponsoring Agency Name and Address **ARIZONA DEPARTMENT OF TRANSPORTATION** **206 S. 17TH AVENUE** **PHOENIX, ARIZONA 85007** Project Manager: John Semmens		13.Type of Report & Period Covered 14. Sponsoring Agency Code
15. Supplementary Notes Prepared in cooperation with the U.S. Department of Transportation, Federal Highway Administration		

16. Abstract

KEY FINDINGS

- Customer factors have little impact on wait times, if any
- The main issue at hand is the non-identifiability of MVD field office service representatives.
- Increasing staffing volume is unlikely to have any positive effect.
- These findings are generalizable across all MVD offices

KEY RECOMMENDATIONS

- An in-depth study of each of the highest volume offices is necessary to remediate the problem
- General remediation strategies will yield some results, but if cost is an issue, there should be targeted studies conducted
- Detailed data should be kept on CSR's and transactions at each MVD office.

17. Key Words Customer Service, Best Practices, Social Loafing		18. Distribution Statement Document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161		23. Registrant's Seal
19. Security Classification Unclassified	20. Security Classification Unclassified	21. No. of Pages 34	22. Price	

SI (MODERN METRIC) CONVERSION FACTORS*

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yards	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
	NOTE: Volumes greater than 1000L shall be shown in m^3.			
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000lb)	0.907	megagrams (or “metric ton”)	mg (or “t”)
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5(F-32)/9 or (F-32)/1.8	Celsius temperature	°C
		ILLUMINATION		
fc	foot candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		FORCE AND PRESSURE OR STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	Square millimeters	0.0016	square inches	in^2
m^2	Square meters	10.764	square feet	ft^2
m^2	Square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	Square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	Cubic meters	35.315	cubic feet	ft^3
m^3	Cubic meters	1.308	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.205	pounds	lb
mg	megagrams (or “metric ton”)	1.102	short tons (2000lb)	T
		TEMPERATURE (exact)		
°C	Celsius temperature	1.8C + 32	Fahrenheit temperature	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		FORCE AND PRESSURE OR STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380

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GLOSSARY OF ACRONYMS

ATRC	Arizona Transportation Research Center
ADOT	Arizona Department of Transportation
CSA	Customer Service Associate
CSR	Customer Service Representative
DOT	Department of Transportation
GAO	Government Accountability Office
GIS	Google Index Search
ID	Identification
MVD	Motor Vehicle Division
NAS	National Academies of Science
SPR	State Planning & Research
TAC	technical advisory committee
TRB	Transportation Research Board
TRIS	Transportation Research Information Services

ACKNOWLEDGEMENTS

The authors would like to thank Project Manager John Semmens, the managers of the Phoenix-area MVD field offices, and the personnel, and especially the interns: Anthony Walter and Diana Artalejo. Without you, this research would have been unmanageable.

A gracious thanks to Diana Artalejo, lead intern. Without her, our project would have been delayed *ad infinitum*.

A very special thanks to Gregory Neidert, whose guidance was invaluable.

Executive Summary

The Arizona Department of Transportation (ADOT), through the Arizona Transportation Research Center (ATRC) has requested that ways to improve customer service and reduce wait times at Motor Vehicle Division (MVD) offices be researched. This research has been conducted by a team of Arizona State University researchers, with the following important points being noted:

Arizona is ahead of the curve in terms of documenting customer service methods.

After conducting a thorough review of transportation literature, journals, and polling of other out-of-state sources, it is our conclusion that Arizona is a trendsetter in not only the amount of data accessible to use to improve practices, but also in that it actually uses data to try to remedy issues in customer service.

Arizona's best practices are some of the best in the nation.

It is also the conclusion of our research that ADOT is *very* attentive to details in terms of scientifically approaching its problems. Whereas many states use best guesses or other such possibly inaccurate methods of management, ADOT seeks to use the best data, processed by people who know how to use such data. There is a great dearth of any real empirical practice anywhere else in the nation — ADOT should be confident of its trendsetting practices.

Wait times at the MVD are greatly increased by a phenomenon known as social loafing.

In the process of examining the issue, our team has concluded that the major contributing factor to increased wait times is a phenomenon known as social loafing (or the diffusion of responsibility) — in lay terms, this is a *weakening of group customer service effectiveness* caused by a *lack of identifiability of individual efforts* and a few other factors. Loafing is common at all locations and sections of MVD offices studied – in short, it did not matter where, when, or how the observations were made: diffusion of responsibility appeared to permeate all offices equally. It is important to note that while prevalent, this phenomenon is not intentional on the part of the customer service representatives (CSRs).

Customer factors play little, if any, part in increased wait times.

Considerations of customer factors weighed heavily in this research, indeed they were the first group we turned to in looking for a possible answer to the issues. Via statistical analysis, however, we concluded that the bevy of customer factors brought into each MVD field office do not have any significant effect on wait times.

Remediation of social loafing factors should be implemented to reduce current problems.

Given these last two points, it is the team's recommendation that a few steps be taken to remediate these "loafing" situations. Among these are:

1) Creating more identifiability for Customer Service Representatives
2) Creating more open channels of goal communication
3) Further study of each MVD office to remediate situation-specific issues

Introduction

Overview

A major concern of Arizona MVD customers is the wait time experienced in the field offices. This report seeks to at least partially explain the phenomenon.

This is not to say that the problem is one that is necessarily direct and straightforward. The seemingly obvious methods of exploring and explaining were not as easily available as one might hope. It should be known that Arizona's methods and practices are quite possibly the best in the nation; hence, comparison to other states very well may be taking a step backwards. Still, this makes the only real comparison that is feasible that of the Arizona MVD to itself; this presented unique challenges as well.

In trying to tease out the reasons behind long wait times, a bevy of factors immediately jump to mind. Could this be an external issue – something related to what the customers bring in to the field offices? Are wait time issues common to all offices, or just a select few? What about the CSR's? Is there anything about them that is contributing to wait times?

Despite all these questions and challenges, this team was able to extract meaningful, answers to the problems posed by this study.

Disclaimer

This report is completion of SPR Project 544. Ian Tingen and David Lovis-McMahon assembled a research team from Arizona State University for this project. Any questions should be directed to Ian Tingen (itingen@gmail.com) or David Lovis-McMahon (dlovism@gmail.com). All hereafter is original research conducted under the direction of Tingen and Lovis-McMahon, with Dr. Gregory Neidert receiving a hearty thank you for his consultation on this project.

Literature Review

Background Information

At the start of this project, ADOT provided the research team with customer service data spanning from FY 2002 to FY 2006. These summary data were used as a basis on which to compare other states' data and approaches, and as a beginning point for rudimentary analysis. These data were instrumental in assessing not only the effectiveness of ADOT's MVD offices and practices, but in establishing the relative position of these same things to other states. A full literature review and analysis of such follow.

Literature Review Introduction

The literature review helps establish three important pieces of information:

1. Which states collect and report customer wait times.
2. What are the mean wait times at other states' MVD facilities, and if possible, what are the specific wait times for licensure and titling.
3. What improvement plans are states implementing to reduce customer wait times or in what other ways are state MVDs improving customer satisfaction.

Methods

Three searches were conducted: a Google Index Search (GIS) of all 50 states was run using a specialized Google search created by Washington State Department of Transportation (DOT) (http://www.google.com/coop/cse?cx=006511338351663161139%3Acnk1qdck0dc), a search of the Transportation Research Information Services (TRIS) (http://ntlsearch.bts.gov/tris/index.do), and a search of the Arizona State University digital catalogue (www.asu.edu/lib). The search terms used were:

- ·customer service
- ·customer wait times
- ·best practices wait times
- ·best practices customer service
- ·driving licensure
- ·licensure
- ·titling
- ·wait times
- ·driver testing

All terms were also run through at least one of these additional modifiers: +improvement/ing, +reducing, comparison between X and Y, +best practices. An additional search modifier was introduced to remove all articles from dot.state.az, because the significantly larger body of research originating from ADOT was heavily skewing searches. This point will be talked about more in depth later.

Synopsis

1) Besides ADOT (for customer wait times) only the Maryland Department of Transportation (MDOT) and Oregon Department of Transportation (ODOT) have publicly released figures of wait times at their MVD facilities.

2) According to a 2004 report from MDOT, average wait time in its MVD offices reached a lowest point of 34 minutes, where as ODOT's average wait time was 13.6 in 2003 (gleaned from its 2005 report). These numbers were reached by the respective states' MVD analogues – with little definition as to what the times entailed.

Findings

Data

The FY 2002-2006 reports provided by ADOT are of great interest to the project in that they determine initial hypothetical causality on the two factors that this project is meant to improve – customer service and wait times. Using data collected from the reports, three facts of interest were found. First, the number of customer service representatives (CSRs) or customer service associates (CSAs) on duty significantly negatively correlated[1] with customer wait times ($r=-.589$[2], $p < .044$[3]) – this is to say that the more CSR's on duty, the less wait time customers had. However, the number of CSRs / CSAs on duty significantly positively correlated with customer time from counter to door ($r=.934$, $p < .000$) – this tells us that the more CSR's on duty, the longer the customer spends at the counter with a CSR. Third, the average wait time from door to counter significantly negatively correlated with average wait time from counter to door ($r=-.765$, $p < .004$); in other words, the more time it took a customer to see a CSR, the less time it took the CSR to complete the transaction and vice versa. These numbers are significant in that, taken as a whole, they point to the possibility of CSRs/CSAs, or at least some of the qualities of CSRs / CSAs, significantly impacting wait times in a negative manner.

Analysis

As highlighted in the methods section ADOT had to be removed from the GIS search, because of the paucity of research conducted by other states. This is significant in that it gives us a relative view of how far ahead of the curve ADOT is in terms of research production, management, publication, and use. The body of literature relevant to this topic is surprisingly sparse in terms of substantive studies and relevant facts. Furthermore, this project is not the only one to come to this conclusion. The 2003 Transportation Research Board report *Research for Customer-Driven Benchmarking of Maintenance Activities* (Booz Allen Hamilton 2003) talks in-depth about the lack of research on the topic - and further states that much of what does exist in terms of the body of literature is statistically invalid - that is, most states are using a rather "shot-in-the-dark" method of approximating success and failure. When the other

[1] For a full description of positive and negative correlation, please see the appendix.
[2] For a full description of r-values, please see the appendix.
[3] For a full description of p-values, please see the appendix.

reports are taken in context of this scientifically significant study, it is clear that most states are not using any degree of solid methodology in terms of creation, execution, and sustaining best practices in MVD analogues. Arizona must avoid these pitfalls and continue in its tradition of excellence.

Peer Information

Looking more broadly, it is clear that ADOT has little to look for in its analogues. In addition to the TRB report mentioned above, a report from the Government Accountability Office (GAO) adds a bit of supplemental evidence that the data collection and usage methods across the nation and at the federal level leave much to be desired. Few standardized accountability variables exist (GAO 2006), and those that do are rarely used in any scientifically valid manner. Taking this into account would be wise - with ADOT aware of its possible pitfalls, it can use the data it has much more effectively, and fall squarely within the recommendations of the GAO.

With that *caveat* in place, it would seem that ADOT has, for its size, much better service in terms of wait times and customer satisfaction. The jurisdictions investigated conduct significantly fewer types of transactions (in terms of raw numbers). Additionally, MDOT and ODOT are demographically much more homogenous than Arizona. Cautiously speaking, this is good news for Arizona, in that initially it seems that Arizona is able to handle much more diversity in transactions and people than its analogue organizations in other states. An in-depth study of transaction types could possibly help flesh this out in a more helpful manner.

As mentioned before, Arizona is ahead of the curve in terms of available relevant research. Though our queries were specific to this project, the amount of Arizona-produced literature dwarfs other sources – for example, in the Google search, the ratio of Arizona-produced to non-Arizona-produced articles approached 3:1. Similar results were found in the other searches conducted. In general, the quality of the ADOT reports was better as well.

Direction

A review of the relevant ADOT literature leaves us walking away with one very key point: we must consider that the licensing and registration core functions are handled though the agency's "legacy systems" which, in some cases, are over thirty years old. MVD has the oldest legacy system of any major Arizona agency. Thirty years is well beyond the expected life of the software applications. The relevant legacy system consists of seven different systems that largely operate independently of one another. The combined systems have 554 screens, 733 transactions and 3,872 programs. MVD also collects in excess of $1.5 billion a year in taxes and fees, making it the State's second largest tax collection agency. This is significant because thousands of governmental and authorized private entities access or update the data within those systems - further complicating matters in the current system.
From the needs assessment we can see there are manifold changes that are about to alter the primary functioning of the MVD. Moreover, the resulting reduction in complexity for the two (license and registration) will drastically alter the way they are handled at MVD facilities.

Thus, the scope of this literature review is constrained by these impending system-wide changes. The focus instead will be on:

- identifying practices that do not rely on the underlying technology
- identifying methods that capture benchmarking data that can be useful in continuous improvement
- using this research to not only improve wait times and customer service, but to possibly help get more efficiency out of the upcoming system overhaul

Real ID

This report would be remiss in its duty if it did not at least briefly touch on possibly one of the most impactful things to hit ADOT — the Real ID Act. (P.L. 109-13)Though the ultimate fate of Real ID rests outside the jurisdiction of ADOT, it is important to note what additional customer impacts could come about because of it.

In short, Real ID will force states to create a uniform database able to synchronize with other states and national databases. Costs for fully implementing the program for Arizona are estimated at around $56 million to start – and that does not include upkeep (Senate Bill 1152). Real ID implementation would require all of Arizona's estimated four million drivers to get a new license that complies with federal regulations. This process would be handled in each of the MVD field offices – creating a large need for processes and staff to be as standardized as possible.

As of the time of this report's publication, states have until December 31, 2009, to comply with Real ID. Whether or not Real ID will be fully implemented is as yet unknown (22 states have drafted non-compliance legislation in what promises to be a lengthy battle), but even now it is certain that if it is implemented, ADOT must move quickly to minimize what will be, at best, a strain on MVD field office resources.

Instrument and Methods

Study Background

As noted in the literature review, any comprehensive comparisons between ADOT practices at MVD locations and other states' analogues are nigh impossible. Additionally, upcoming changes in the ADOT MVD system add to the complexity of the situation. Therefore, it was necessary to develop methods and tools to assess things that MVD offices have control over currently, and will continue to have control over throughout the changes. We have addressed all of these needs in our methods and tools, and - explain them a bit more in depth here.

Initial interpretation of the data furnished by ADOT provided a solid starting place for structuring the research. First, monthly trends in customer service data were clear, as were possible explanations for said same fluctuations. These data also gave us some other questions: what exactly went into "wait times" and the process of actually being serviced at an MVD field location? With these ideas in mind, initial trial observations were conducted at four different MVD field offices. Offices to conduct pilot research were chosen on a number of criteria. Population demographics were taken into account, and those offices with medium to highly populated areas were selected. We also chose offices which served diverse populations in terms of primary language and socioeconomic status to capture the most variance possible. (It should be noted that these were all offices that had the Q-matic queue management system. Non-Q-matic offices are scarce throughout the state and such offices are also located in low population areas; long wait times are not likely to be an issue in such areas.) All of the offices chosen were in the Phoenix metropolitan area. Observations were conducted at different times across the month. These initial observations were used to craft a wait time measurement tool that allowed assessment of wait times across a great number of factors: what partitions wait times had, how customer traffic flow affected wait times, how staffing affected wait times, how the actual structure of the field office affected wait times, and how customer traits affected wait times. These factors helped create an instrument to track and analyze wait time. A more in-depth description of each of these factors and their rationale follows.

Instrument Design

During initial observations, it became clear that assessing wait time would not necessarily be as straightforward as it seemed. We observed different phases in wait time, something that was not covered in any of the literature or data provided to us. As such, we examined the process and came up with what seemed to be the natural process of customer service at MVD locations, and the wait times associated with each. These intervals allowed us to assess at which stage a customer waited the longest. (For example, long wait times to get a transaction ticket could be a result of a high volume of customers.) The identified intervals were:

1. Initial customer arrival time to receipt of Q-Matic ticket
2. Time when a customer received a Q-matic transaction ticket to when customer was called to a window.
3. Time when the customer was called to a window to customer's arrival at window.

4. Time of the customer's arrival to the window to customer leaving.
5. Overall wait times were calculated by adding up these different time intervals.

Our next question was that of customer flow. In an informal interview, an MVD employee indicated that the busiest days were the 15th and last day of each month due to registration renewals and other business needing to be transacted with these dates as a deadline. These trends were also hinted at (though not empirically tested) in the ADOT yearly reports. Observational research indicated these postulates to be true; furthermore, we were able to track trends across the month in terms of how much volume was processed over each period of days. As a result, each 15 day interval within a month was divided into high, medium, and low traffic periods. The 1st through 5th and 16th through 20th were the low traffic periods because they directly followed the two busiest days which lead to a sequential decrease in customer volume. The 6th through 10th and 21st through 24th were medium traffic periods, indicating a "ramping up" in customer flow. The 11th through the 15th and the 25th to the 30th/31st were observed to be high traffic periods, in line with the previous informal observations.

An issue related to customer flow was that of staffing. During our observations, we noticed that during different days, different amounts of staff were present to help customers. As a result, the instrument was given a section in which to track number of staff on duty, both as a raw score and as a percentage of total possible capacity. This allowed us to look at rates both for individual offices and as a way to equalize all offices observed.

Another factor considered in the creation of our instrument was that of the actual form and physical location of the office. Some offices were noted as having a very open structure, one that had monitors easy to see from waiting areas and were put together in seemingly straightforward fashions. Others were noted as being somewhat less convenient, with some waiting areas not having immediate or easy access to monitors. We also took note of the location of each office; ostensibly different locations might have different things going on in terms of wait time. Each of these factors was noted to see if there was any effect of form on customer wait times.

The final and perhaps most obvious factor that we had to consider was that of the customer. During initial observations, we observed many customer issues that could potentially increase wait times. For example, we noticed that some customers came in with many people, usually small children. Our instrument included an area to track how many people came in with each customer, as we thought that the additional distractions could make the customer oblivious to his number being called. We also tracked whether or not a customer had other distractions while waiting – reading, listening to music, sleeping, and cell phone usage were all monitored, as we thought that these things may make a person less likely to see or hear when that his number was called, thus increasing wait time. Demographic factors were also selected: gender, apparent ethnicity, and age were taken into account to see if any effect of said same could be found.

Summarily, our developed instrument allowed analysis of five key factors potentially effecting wait times:

1. Wait times at different points in the service process
2. Customer flow density
3. Number of staff present
4. Physical characteristics of location
5. Customer traits

Please see Figure 1 in the appendixes for an example of the data collection instrument.

Research Methods

After development of the instrument, three field observers conducted reliability training and field observations at which all three observers were present. Inter-rater reliability analysis was conducted across these sessions, and sufficient reliability (α[4] = .89) was reached to have each observer conduct analysis on their own. Over a period of six months, 30 field observations were conducted at five MVD field offices, resulting in ~ N[5] = 300 data points for customer wait times and transactions. These data were distributed roughly evenly across each office. Data were then entered into a statistical analysis program, SPSS and appropriate statistical tests were run.

[4] For a full description of alpha levels, please see the appendix.
[5] For a full description of N, please see the appendix.

Data

Correlations found among the variables of study are shown in Table 1. Several significant associations between the variables were found after a bivariate correlation analysis was conducted. First, the amount of customer traffic and number of minutes from arrival until ticket dispensed were significantly and positively correlated ($r=.368$, $p<.01$). Also positively correlated with amount of customer traffic were the number of total windows per office ($r=.219$, $p<.05$). A few other correlations among the variables were significant and noteworthy. As the number of open windows per office increased, the number of minutes from arrival until a ticket was dispensed increased as well ($r=.628$, $p<.01$). In addition, the number of open windows per plant was significantly and positively associated with the number of minutes between receipt of a ticket and reaching the window ($r=.465$, $p<.01$). Therefore, the number of open windows per office was positively correlated with the number of minutes from initial arrival until reaching the window ($r=.548$, $p<.01$). Finally, as the number of total windows per plant increases, so does the number of open windows per plant ($r=.812$, $p<.01$).

A contrast analysis of Location 1 and Location 2 was also conducted. These locations are the highest-volume locations, and a specific analysis of them was conducted to see if differential effects were being noted as opposed to the total population. Correlations found among the variables of study between Location 1 and Location 2 are shown in Table 2. As was found in the correlation analysis of all the MVD locations, the amount of customer traffic and the number of minutes from initial arrival until a ticket was dispensed are positively correlated ($r=.394$, $p<.01$). However, there are two significant correlations that have especially important implications for customer service. As the amount of customer traffic decreases between Location 1 and Location 2, the number of minutes between a ticket being dispensed and the customer reaching the window increases ($r= -.379$, $p<.01$). Therefore, as the amount of customer traffic decreases, the number of minutes from initial arrival until reaching the window increases as well ($r= -.268$, $p<.05$). Also of statistical significance was the negative association between the amount of customer traffic and the number of open windows per office ($r= -.315$, $p<.05$). However, this does not necessarily account for longer wait times, due to the positive correlations found between number of open windows per office and segmentation of the dependent variable. As the number of open windows per office increases, so does the number of minutes from initial arrival until a ticket is dispensed ($r=.611$, $p<.01$). The number of open windows per office and the number of minutes from a ticket being dispensed until the customer reaches the window is positively and significantly associated ($r=.647$, $p<.01$). In addition, as the number of open windows per office increases, so does the number of minutes from initial arrival until arrival at the window ($r=.713$, $p<.01$).

The analyses conducted with all of the MVD locations indicate that as the number of customer service representatives increases, so does the customer wait time (arrival to ticket, ticket to window, and initial arrival to window). The hypothesis is further supported when a contrast analysis of the highest trafficked locations (Location 1 and Location 2) is conducted. Not only do the significant positive correlations between number of customer service representatives per plant (operationalized by number of open windows) and number of minutes from initial arrival until reaching the window still exist, but an inverse relationship between amount of customer traffic and wait times co-exists. Therefore, as shown by Table 1 and Table 2, periods of low traffic in these locations lead to longer wait times than periods of high traffic.

Table 1.

Correlations for All MVD Locations

		Traffic	Number of Minutes from Arrival to Ticket Dispensed	Number of Minutes from Ticket to Window	Number of Minutes from Arrival Time to Window	Number of Windows Open Per Plant	Total Number of Windows Per Plant
Traffic	Pearson Correlation	1	.368**	-.096	-.008	.104	.219*
	Sig. (2-tailed)		.000	.300	.928	.255	.016
	N	122	121	119	119	121	121
Number of Minutes from Arrival to Ticket Dispensed	Pearson Correlation	.368**	1	.328**	.510**	.628**	.397**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	121	121	119	119	120	120
Number of Minutes from Ticket to Window	Pearson Correlation	-.096	.328**	1	.979**	.465**	.228*
	Sig. (2-tailed)	.300	.000		.000	.000	.013
	N	119	119	119	119	118	118
Number of Minutes from Arrival Time to Window	Pearson Correlation	-.008	.510**	.979**	1	.548**	.283**
	Sig. (2-tailed)	.928	.000	.000		.000	.002
	N	119	119	119	119	118	118
Number of Windows Open Per Plant	Pearson Correlation	.104	.628**	.465**	.548**	1	.812**
	Sig. (2-tailed)	.255	.000	.000	.000		.000
	N	121	120	118	118	121	121
Total Number of Windows Per Plant	Pearson Correlation	.219*	.397**	.228*	.283**	.812**	1
	Sig. (2-tailed)	.016	.000	.013	.002	.000	
	N	121	120	118	118	121	121

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 2.

Correlations for MVD Location 1 and Location 2

		Traffic	Number of People with Customer	Number of Minutes from Arrival to Ticket Dispensed	Number of Minutes from Ticket to Window	Number of Minutes from Arrival Time to Window	Number of Windows Open Per Plant	Total Number of Windows Per Plant
Traffic	Pearson Correlation	1	-.072	.394**	-.379**	-.268*	-.315*	.297*
	Sig. (2-tailed)		.593	.002	.004	.044	.017	.025
	N	57	57	57	57	57	57	57
Number of People with Customer	Pearson Correlation	-.072	1	.093	.040	.055	-.010	.006
	Sig. (2-tailed)	.593		.492	.767	.687	.942	.967
	N	57	57	57	57	57	57	57
Number of Minutes from Arrival to Ticket Dispensed	Pearson Correlation	.394**	.093	1	.339**	.507**	.611**	-.355**
	Sig. (2-tailed)	.002	.492		.010	.000	.000	.007
	N	57	57	57	57	57	57	57
Number of Minutes from Ticket to Window	Pearson Correlation	-.379**	.040	.339**	1	.982**	.647**	-.573**
	Sig. (2-tailed)	.004	.767	.010		.000	.000	.000
	N	57	57	57	57	57	57	57
Number of Minutes from Arrival Time to Window	Pearson Correlation	-.268*	.055	.507**	.982**	1	.713**	-.592**
	Sig. (2-tailed)	.044	.687	.000	.000		.000	.000
	N	57	57	57	57	57	57	57
Number of Windows Open Per Plant	Pearson Correlation	-.315*	-.010	.611**	.647**	.713**	1	-.795**
	Sig. (2-tailed)	.017	.942	.000	.000	.000		.000
	N	57	57	57	57	57	57	57
Total Number of Windows Per Plant	Pearson Correlation	.297*	.006	-.355**	-.573**	-.592**	-.795**	1
	Sig. (2-tailed)	.025	.967	.007	.000	.000	.000	
	N	57	57	57	57	57	57	57

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Analysis

The data from this study are quite telling. First, we must discuss what does NOT affect customer wait times. Each of the following had non-significant relationships (when controlling all other variables) with customer wait times:

Customer Traits

- Customer demographic factors
- Customer distractors
- Number of people with customer

Customer Volume

- Number of customers
- Time of month (low, medium, or high traffic)

MVD Field Office Factors

- Location
- Shape / Layout

Of these things, only customer volume had a negligibly positive relationship with wait time. All other factors had no significant effect on wait time.

Controlling for all other factors, factors that did have a significant relationship with wait time are:

- *Number of Customer Service Representatives on duty*
- *Percentage of Customer Service Representatives on duty out of total possible Customer Service Representatives*

Each of these variables had a significant, positive relationship with customer wait times.

The relationships noted in the data are not necessarily the most intuitive, but can be explained rather simply. As seen, customer variables have little, if anything, to do with wait time. This is most likely an effect of the clarity of the Q-Matic system: when people's numbers are called, they are done so unambiguously and are responded to quickly. Customer demographics, distractors, and the number of people with the customer were all non-issues.

Also a non-issue is customer flow. By a process called "controlling," we are able to statistically remove the influence of all factors save our factor of interest. By doing this, we can examine if different levels of our factor of interest are directly influencing wait times. In the case of customer flow, there is no relationship. Though there is a slight upswing in wait time with more customer flow, it is negligible and not the primary cause of long wait times. The same is true of the time of month that is being examined.

Another non-issue is that of location and layout of the actual MVD office. Controlling for all other factors shows that there is no effect of either location or layout. This is important to note as the drastically different demographics of each location did not have as much of an effect as expected.

Finally, we come to staffing. Both measures, those of raw number of staff and percentage of staff working, were significantly, positively correlated with increased wait times. In short, this means that the more staff available, the longer customers had to wait for service. These statistics were derived in the same manner as those previous – removing the influence of all other variables to see ONLY the effect of the current analysis. Further analyses of the staffing level find that not only is it significantly positively related with wait times, but that these effects are almost 40 times greater than chance alone.

In any study of this scope, it is important to take the utmost care to assess each individual variable carefully, systematically, and rationally. This study has done just that; months of research, observation and interviews culminated in identifying factors relevant to the research question. Data were collected on these relevant factors and analyzed. The implications that follow are directly pointed to by the data, and are relatively unambiguous.

First, it is important to note the universality of all trends discussed. The process of statistically controlling is powerful and central to all analyses – it allows us to specifically examine each part of the puzzle and see just what it contributes to the overall picture. Each finding does just that: tells us what specifically it contributes to wait time. As stated earlier, no customer or location factors play any significant role in long wait times. Further, there is little evidence to suggest that these factors work in conjunction with any others to significantly increase wait times.

We are, therefore, left with only one thing: numbers of customer service representatives. The statistics are phenomenally large, and as such deserve an explanation. Fortunately, this same sort of situation has been well documented in organizational psychology literature[6] for years. The numbers found at ADOT are a classic case of what is called "social loafing."

Social loafing, also known as the diffusion of responsibility, occurs in situations where individual contributions to a group goal are not salient. This results in a less-active, more relaxed work strategy on the part of the individual. Many different factors can contribute to this occurrence, but they all result in the same general downward trend in productivity. Specific to ADOT, this means longer customer wait times.

Put another way, diffusion of responsibility impacts ADOT's main concern of this project – customer satisfaction. It does this because of the negative impact it has on customer wait

[6] For more reading:

- Latane, B., Williams, K., & Harkins, S., Many hands make light the work: The causes and consequences of social loafing, *Journal of Personality and Social Psychology*, June 1979, Vol. 37, 822-832
- Karau, S. J. & Williams, K. D. (1993). Social loafing: A meta-analytic review and theoretical integration. *Journal of Personality and Social Psychology*, *65*, 681-706.
- Jackson, J. M. & Harkins, S. G. (1985). Equity in effort: An explanation of the social loafing effect. *Journal of Personality and Social Psychology*, *49*, 1199-1206.

times. What happens is this: as more people are expected at MVD branches, more personnel are assigned. However, instead of the predicted increase in the ability of the branch to serve customers in a timely fashion, the opposite happens. This puzzling result is because as more CSR's and CSA's come on, the visibility of that individual's contributions to the whole of customer service is diminished.

An illustration of this point: if there are three people who are on duty, then it is quite obvious to each individual what the others are doing. This makes people want to work faster, more efficiently, and overall better because they are aware that everyone can see what they are doing: it acts as a positive reinforcer. Now look at another situation, say, with 20 people on duty. Because of the sheer number of people on duty, personnel are aware that they are not being watched nearly as carefully. This can lead to a more lax approach to getting customers processed, and leads to the downturn in time that we have seen.

Conclusion and Implications

As shown in this report, Arizona's Department of Transportation has many things to be proud of – a strong dependence on statistical evidence, one of the most thorough data collection procedures in the nation, and a willingness to use those things to better processes. Before continuing too far, we also must reiterate the fact that there is little to compare Arizona to because of its reliance on good data and methodology. Few, if any, other states are even able to come close to the soundness of these processes. Because of this, we recommend using the best practices of this state against itself for benchmarking and measurement of success, all the while keeping the message of the TRB report at the forefront of future directions. At this point, Arizona has started down a great track. These next points are made while keeping this tradition in mind.

First, the phenomenon of social loafing is the most prevalent finding of this study. After carefully analyzing a bevy of factors ranging from customer traits to layout of the actual offices, the conclusion is clear. This is not something that is unmanageable in any way; in fact it is a rather common problem in workplaces, and one that can be remedied quite effectively, given the proper investment in looking at the sources of downturn unique to each group of workers. This problem is easy to generally identify, but specifics of each situation may vary widely.

That is why the next steps to reducing this problem are crucial. In order to effectively combat the diffusion of responsibility phenomenon, it is of the utmost importance to understand how it works uniquely in each situation. Differences can include but are not limited to: visibility of personnel's individual contribution, visibility of group personnel efforts, ratio of personnel to supervisors, ratio of personnel to customers, length of shift, office design, etc. The next phase of this study should look at these and all other contributing factors in order to remedy the problem.

The future implications for this study and ones to follow it are rather straightforward: ADOT MVD field offices have an affliction common to many large-scale workplaces. Through careful measurement and study, this problem can be at least partially nullified. We suggest a thorough study of the most highly trafficked MVD offices to understand how diffusion of responsibility affects each of them. From that study, proper incentive structures and remediation strategies can be developed and implemented. This will benefit MVD in three poignant ways. First, wait times will be reduced greatly, and customer satisfaction should improve as a result. Second, MVD CSR's will be encouraged in very organic ways to keep their level of service high. Third, Arizona will be a trendsetter yet again in providing the very best service available via a mix of social science and applied business practices.

General Remediation Strategies

In general, diffusion of responsibility can be remedied through increasing the identifiability of the individual's contribution to the group workload. In ideal situations, constant feedback is the best way to increase this. If such a strategy is not practical, then periodic updates of efficiency can help ameliorate the problem.

With especially large groups, another way to increase efficiency is to create smaller groups that are part of the whole. For example, splitting 20 people in to four smaller groups of 5 can help individuals realize their contribution to the whole. When used in conjunction with the identifiablity suggestions from above, this can prove to be a very useful tactic.

It should be noted that well-structured reward programs can also be incentives to improve performance, given that the path from individual performance to group performance to reward is made salient, and that the group is able to deal with freeloaders in a quick manner.

It should be stated again, however, that these strategies are general. Targeted, specific programs are always better at amelioration than ‘blanket strategies’.

Recommendations

- An in-depth study of each of the highest volume offices is necessary to remedy the problem.
- General remediation strategies will yield some results, but if cost is an issue, targeted studies should be conducted
- Detailed data should be kept on CSR’s and transactions at each MVD office.

Appendix and Figure

Statistical Terms

Correlation: Correlation is a measure of how closely two given variables are related. Correlation is measured either on a scale of -1 to 0 (negative correlation) or 0 to 1 (positive correlation). The closer (in either direction, positive or negative) the number is to 1, the more closely related the two variables are. Generally speaking, a correlation from |.00 to .30| is considered a light relationship, from |.31 to .49| a moderate relationship, and from |.50| up is considered a strong relationship.

Negative Correlation: Negative correlation is a condition where the relationship between two variables is inverse – as one variable goes down, the other goes up (and vice versa).

Positive Correlation: Positive correlation is a condition where the relationship between two variables is direct – as one variable goes up, so does the other; or as one variable goes down so does the other.

R-values: R is the numeric representation of a correlation between two variables. Its range is from -1 to 1. A positive value indicates a positive correlation; a negative value indicates a negative correlation.

Alpha Level (α): Alpha is a measure of how consistently a group of observers describe similar events. It can be a value anywhere between 0 and 1. Higher values indicate more consistency. Generally, alpha values greater than .8 are sufficient for field research.

N: Simply put, N is the number of observed subjects or the number of discrete observations in a study.

Article Review

ADOT/MVD Strategic Plan -- FY 2001
ADOT/MVD Strategic Plan -- FY 2002
ADOT/MVD Strategic Plan -- FY 2003
ADOT/MVD Strategic Plan -- FY 2006

Longitudinal Data Analysis of MVD Statistics for FY2002 to 2006:
The purpose of the longitudinal data analysis is to get a sense of how important statistics like average customer total wait time have changed over the last five years. It is also useful to see what current trends are and what those trends have to say about the future.

The following categories were used in this data analysis:

1. Number of MVD customers served in field offices (in thousands)
2. Number of transactions (thousands)
3. Average customer wait time (door-to-counter) in field offices (minutes)
4. Average transaction time (counter-to-door) in field offices (minutes)
5. Average customer total visit time (door-to-door) in field offices (minutes)
6. Average number of CSAs and CSRs (for FY 2003 to 2006 only).

The below table summarizes the range of values as well as the average values over the past five years:

Descriptive Statistics

	Range	Minimum	Maximum	Mean
Number of MVD customers served in field offices (in thousands)	153.3	289.7	443.0	380.055
Number of transactions (thousands)	175.5	396.0	571.5	476.724
Average customer wait time (door-to-counter) in field offices (minutes)	25.5	10.2	35.7	19.363
Average transaction time (counter-to-door) in field offices (minutes)	1.3	7.7	9.0	8.338
Average customer total visit time (door-to-door) in field offices (minutes)	24.7	19.2	43.9	27.702
Average number of CSAs and CSRs	224.0	664.0	888.0	761.229

The table shows that on average it takes approximately 19 minutes for a customer to be seen by Customer Service Agent, and that it takes approximately 8 minutes for the transaction to take place.

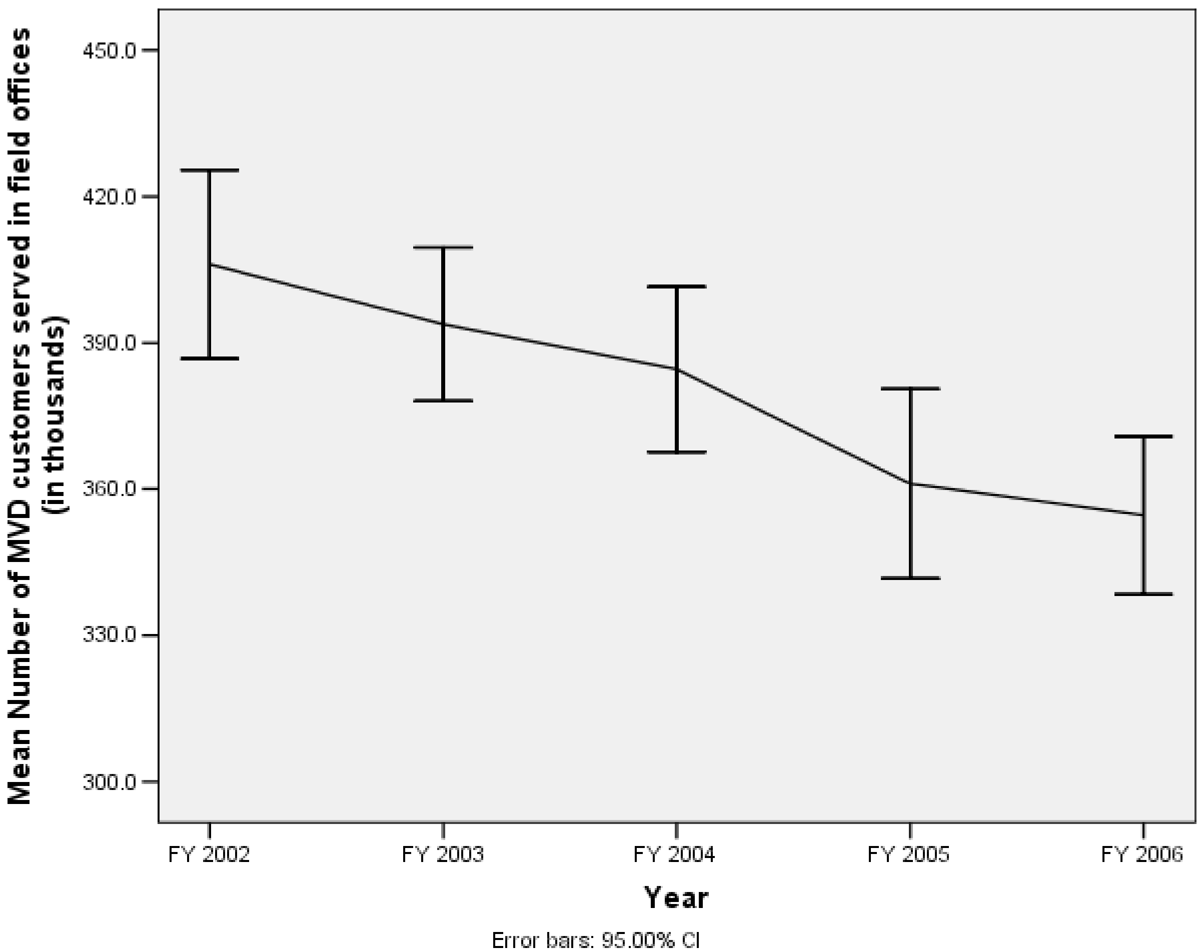
Descriptive Statistics

	Range	Minimum	Maximum	Mean
Number of Transactions per Customer	.3735	1.0893	1.4629	1.257052
Average Wait Time divided by Number of Transactions per Customer	19.01	7.99	27.00	15.3739
Average Transaction Time divided by Number of Transactions per Customer	1.83	5.81	7.64	6.6514

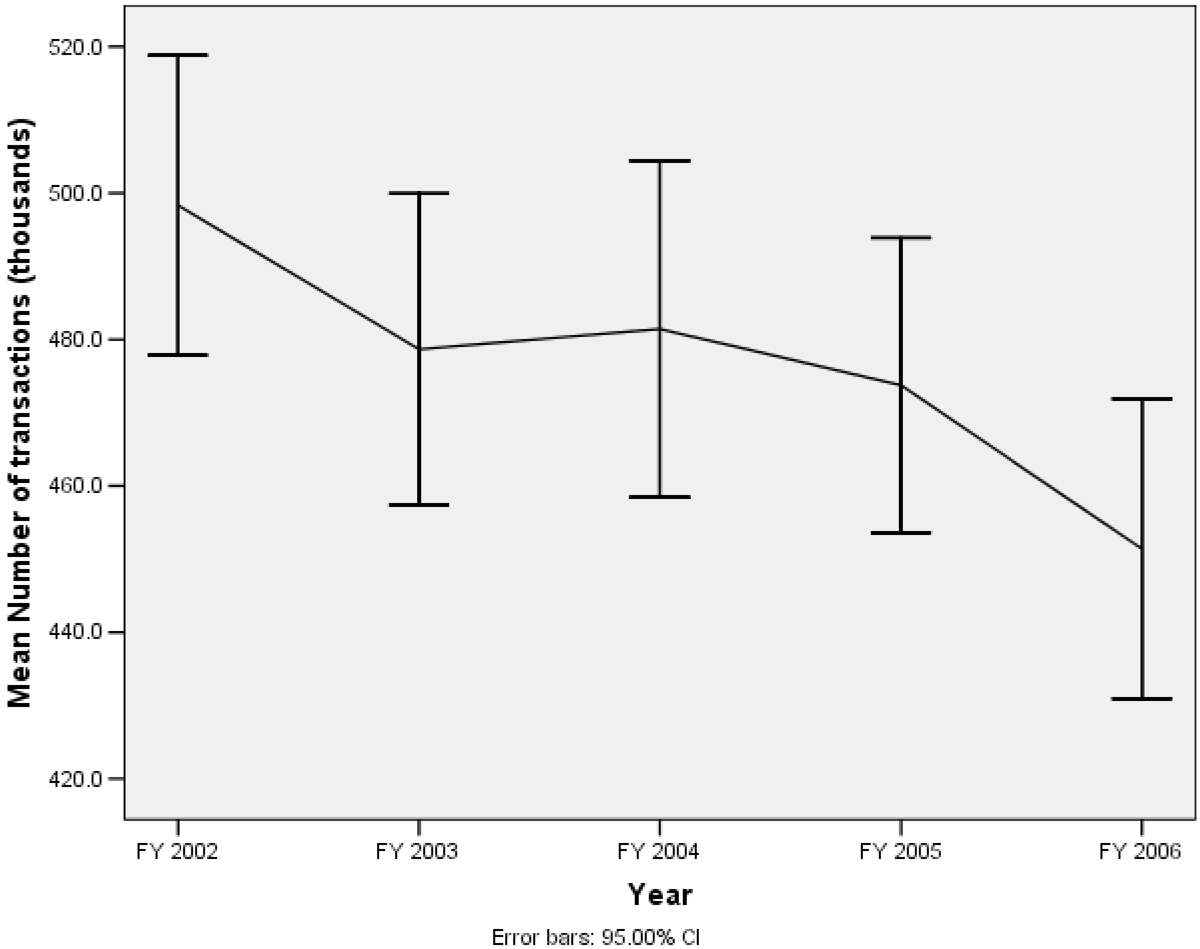
While the average number of Transactions per Customer isn't useful by itself, it is necessary in order to calculate the wait time and transaction time for a single transaction. Thus it takes approximately 15 minutes and 22 seconds in wait time for a single transaction and an additional 6 minutes and 39 seconds in processing time for a single transaction.

Beyond the descriptive statistics it is useful to get sense of how these different categories have changed over time, and often the best way to do so is visually. The following graphs illustrate how these different categories have changed from FY2002 to FY2006. They also include Confidence Intervals (also known as Error Bars). The Confidence Intervals on these graphs are calculated to 95%, which allows us to visually determine which years are significantly different from each other. If two years have overlapping Confidence Intervals in any way, then those two years are not statistically different from each other. Conversely if there is no overlap in Confidence Intervals we can be confident in saying that any given two years are significantly different from each other.

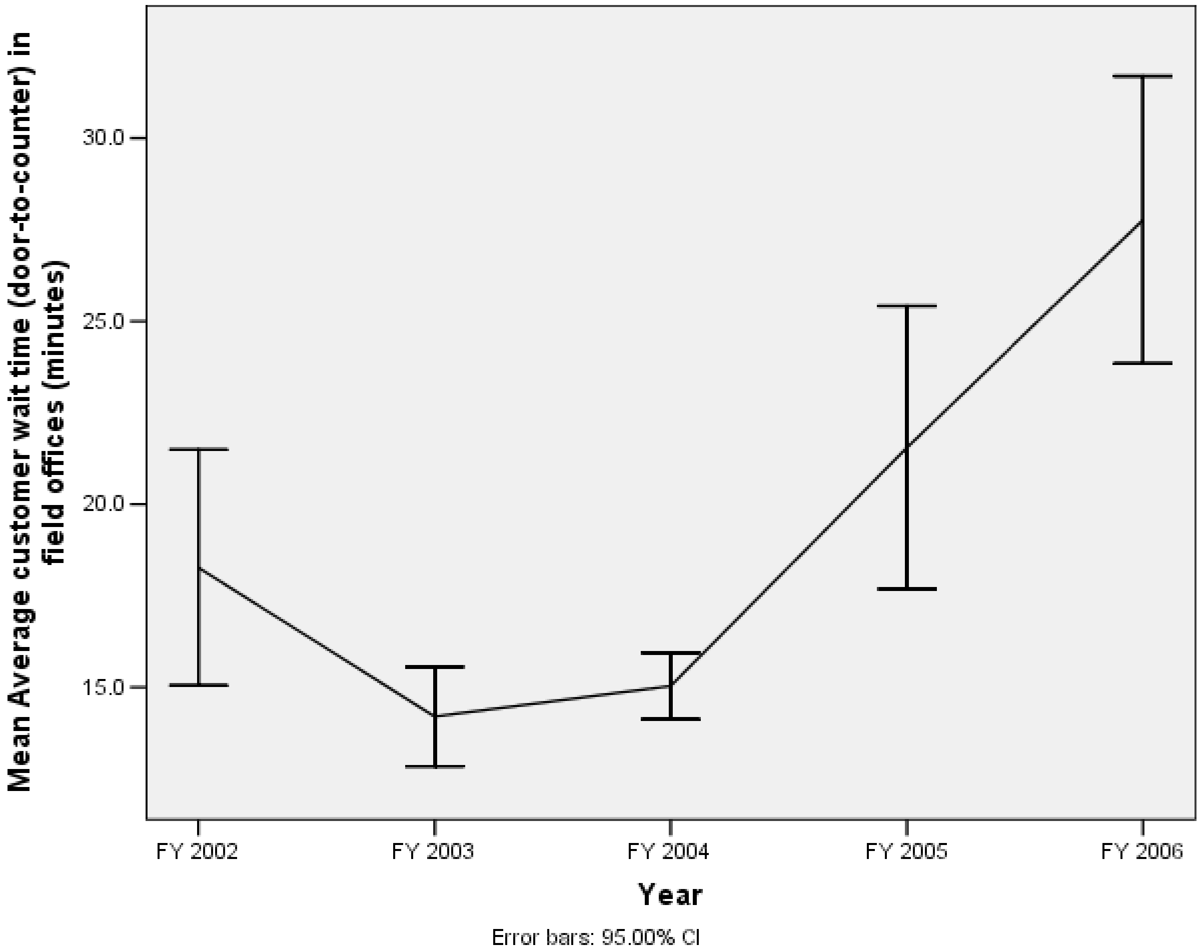
Graphs:



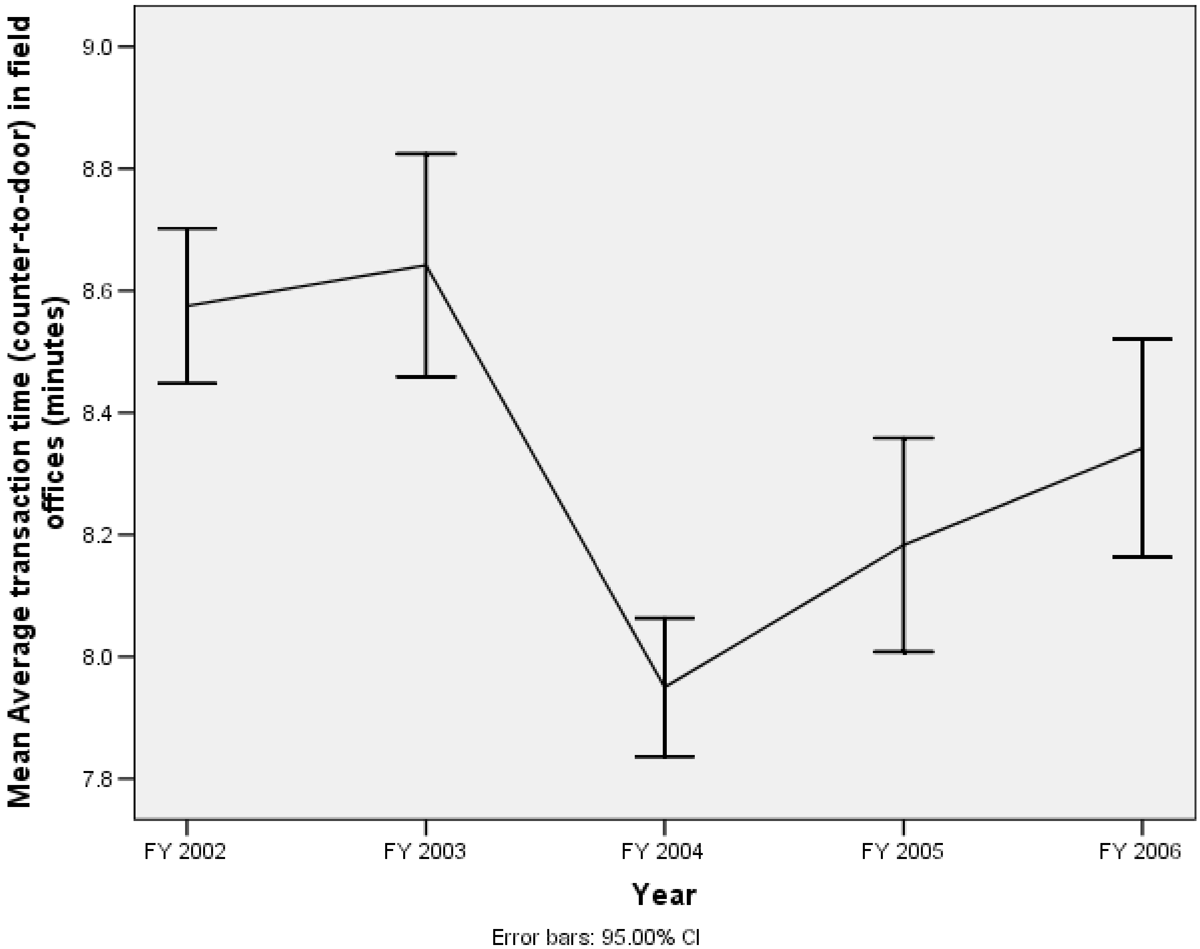
While the graph clearly shows a downward trend in the number of Customers served in field offices, it isn't until FY2006 that we see levels significantly lower than FY2002.



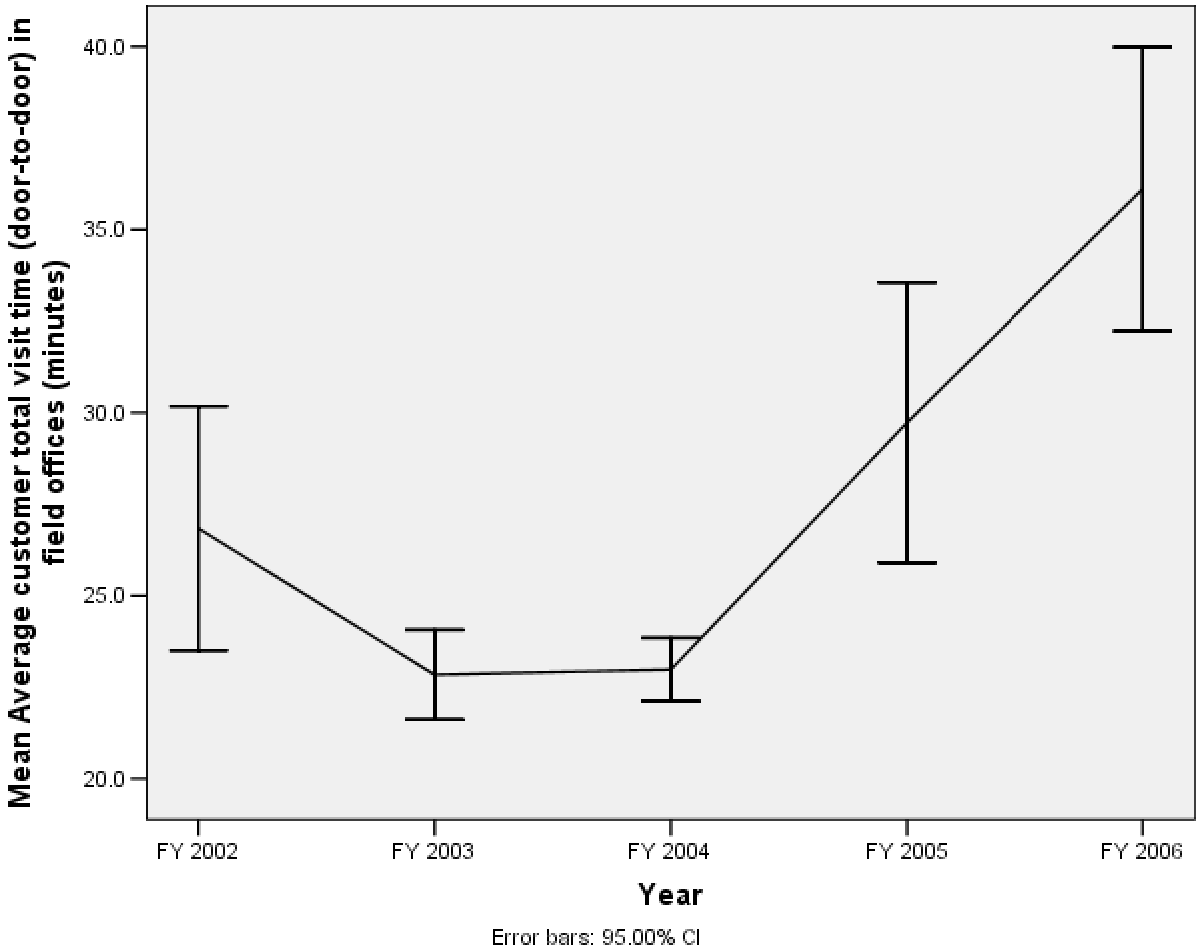
The same holds true for the Number of Transactions, as with the Number of Customers served, there is an observed downward trend that does not become significant until FY2006.



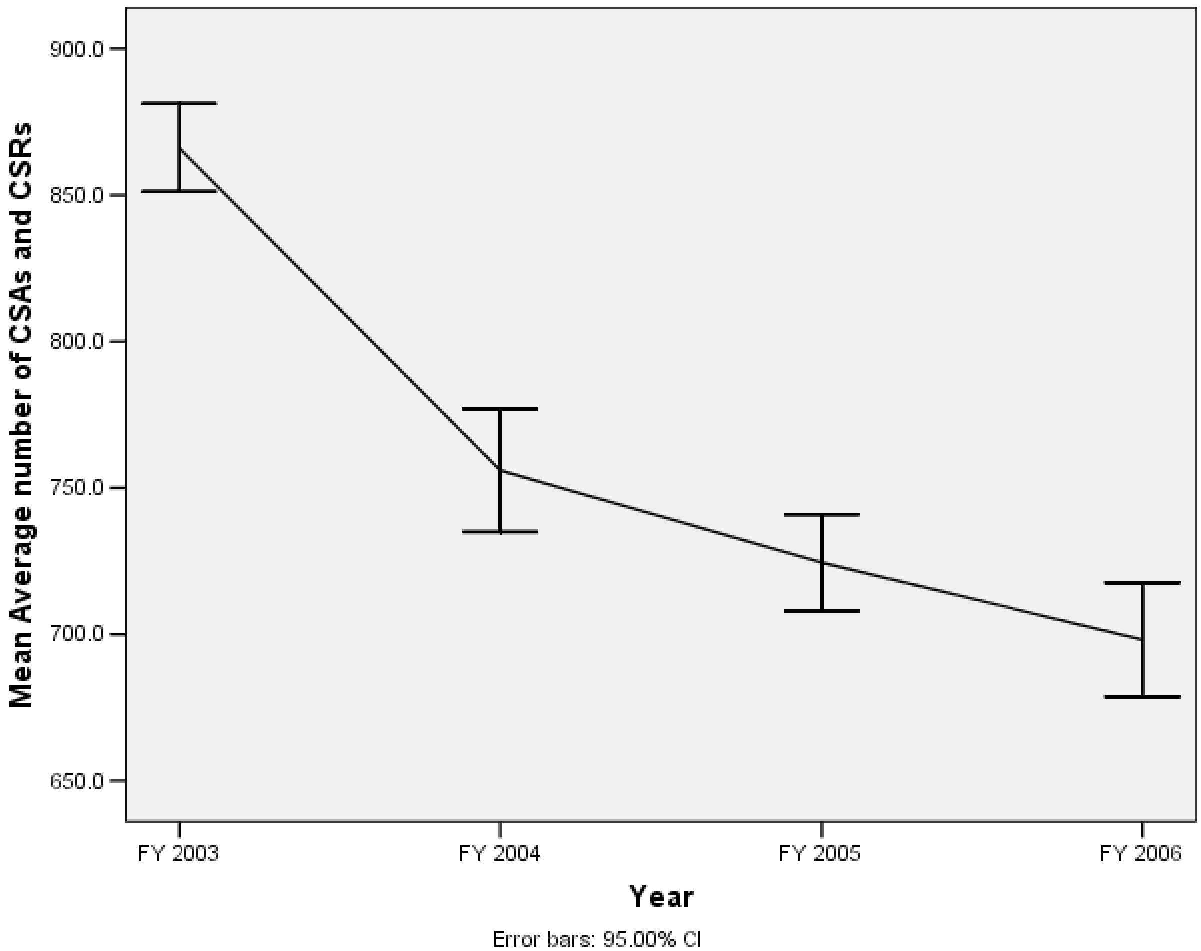
Average customer wait time is far more interesting in that there is a dramatic indentation of near 15 minute average wait times in FY 2003 and FY 2004, with a dramatic and significant increase in wait times in FY 2005 and FY 2006.



As shown, FY 2004 had a dramatic and significant decrease in transaction times from FY2002 & FY2003 levels, with a significant increase in time by FY 2006. It is worth noting that FY 2006 is not significantly different from FY 2002 & 2003, so it would be correct to say that FY 2006 is indistinguishable from pre FY 2004 levels.



The total average wait time reflects the trend found in average customer wait time, because average customer wait time makes up a majority of total average wait time. Data for FY 2003 & FY 2004 are significantly lower than those for FY 2005 & FY 2006.



What is striking about this graph is the significant decrease in the number of CSAs and CSRs between FY 2003 and FY 2004, a trend that results in a significant difference between FY2004 and FY2006.

Conclusion:

It is interesting to note that while the number of customers and the number of transactions have dropped from FY2002 to FY2006, both the wait time and transaction time are not significantly different in FY2006 than in FY2002. The next series of analysis will be aimed at trying to discern why.

Correlations:

Moving beyond descriptive statistics and graphs, correlations are the next most common tool for identifying relationships between two things. The following table summarizes the correlations between the six different categories reported in the MVD Statistics.

	Number of MVD customers	Number of transactions	Average customer wait time (DtC)	Average transaction time (CtD)	Average customer total visit time (DtD)	Average number of CSAs and CSRs
Number of MVD customers						
Number of transactions	0.853					
Average customer wait time (DtC)	-0.284					
Average transaction time (CtD)						
Average customer total visit time (DtD)	-0.281		0.999			
Average number of CSAs and CSRs	0.474		-0.734	0.516	-0.712	

(DtC: Door to Counter CtD: Counter to Door DtD: Door to Door

In the above table only statistically significant correlations are listed. A positive correlation indicates a direct relationship where the increase or decrease in one variable corresponds to an identical increase or decrease in the other. The strength of that relationship is measured on a scale of 0 to +1, where 0 indicates that there is no relationship and +1 indicates there is a perfect direct relationship. Conversely, a negative correlation indicates an indirect relationship where the increase or decrease in one variable is the inverse or opposite of the increase or decrease in another. Similarly the strength of a negative correlation is measured on a scale of 0 to -1, where 0 indicates that there is no relationship and -1 indicates there is a perfect indirect relationship.

For example, we expect and we find that the number of MVD customers has a significant and highly positive correlation with the number of transactions (.853), whereas, the number of MVD customers has a significant but weak negative correlation with the average customer wait time (-0.284). Finally, the positive correlation between Average customer wait time (Door to Counter: DtC) and average customer total visit time (Door to Door: DtD) is excellent example of a near perfect correlation (.999), and it illustrates how insignificant a role average transaction time (Counter to Door CtD) has in average customer total visit time (DtD).

Moving on to the analysis the weak negative correlation between number of MVD customers and customer wait time lends support to our initial observation that despite decreasing numbers of both customers and transactions there are increasing levels of customer wait time (-0.284). One plausible explanation is the strong negative correlation between the average number of CSAs and CSRs and the average customer wait time (DtC) (-0.734). We know from the graphs that were discussed earlier that there has been a significant decrease in the average number of CSAs and CSRs from 2003 to 2006. The negative correlation implies that it is the decreasing average number of CSAs and CSRs that is responsible for the apparent increase in wait times.

There is a way to test to see what effect the average number of CSAs and CSRs is having on the correlations between other variables.

*Controlling for Average Number of CSAs and CSRs	Number of MVD customers	Number of transactions	Average customer wait time (DtC)	Average transaction time (CtD)	Average customer total visit time (DtD)
Number of MVD customers					
Number of transactions	0.883				
Average customer wait time (DtC)					
Average transaction time (CtD)	-0.493	-0.470	0.398		
Average customer total visit time (DtD)			0.998	0.451	

As the above table illustrates, the weak correlation between number of MVD customers and average customer wait time (DtC) disappears when the average number of CSAs and CSRs is taken into account. Correspondingly, the correlation between number of MVD customers and average customer total visit time (DtD) also goes to zero.

Conclusion:
In summary, the descriptive statistics show:
1. Average customer wait time (door-to-counter) in field offices (minutes) is **19:22** minutes.
2. Average transaction time (counter-to-door) in field offices (minutes) is **8:20** minutes.

3. The shortest customer wait time (door-to-counter) in field offices (minutes) occurred in 2003 with a record **14:12** minutes.
4. The longest customer wait time (door-to-counter) in field offices (minutes) occurred in 2006 with a record **27:46** minutes.
5. The shortest transaction time (counter-to-door) in field offices (minutes) occurred in 2004 with a record **7:57** minutes.
6. The longest transaction time (counter-to-door) in field offices (minutes) occurred in 2003 with a record **8:39** minutes.

The data analysis shows that the decreasing number of CSAs and CSRs appears to be mediating the effect that the number of MVD customers served has on average customer wait time (door-to-counter) in field offices.

Associated Files

ADOTDATA.sps
MVDtablerevisedII.xls

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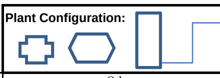
FIGURE 1 – Data Collection Instrument

Motor Vehicle Division Study Behavioral Checklist

Location | *Date:* M T W Th F S
Q-Matic: Yes No | *Time of Arrival:* _______
Kiosk: Yes No | *Time of Departure:*
Number of Windows: | *Number of Windows open:*

Plant Configuration:



Customer	Transaction Number	Arrival Time	Number of people with customer	Physical Descriptors Ethnicity/Gender/Hair/Attire	Time ticket was dispensed	Window Number	Time called to window	Second calling: Time of 2nd calling	Second calling: Time new number called	Time of arrival to window	Distractor(s)	Other
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
11												
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24												
25												

Distractors: **C**- children, **R**- reading, **P**- phone

Possible others or descriptors: **OL**-other language, **S**-Spanish, **H**-hispanic, **C**-Caucasian, **As**-Asian, **AF**-African American, **O**-other, **m**-male/**f**-female, **B**- blonde, **Br**-brown hair, **R**-redhead, **Bk**-black hair