Iowa 511 Traveler Information System User Analysis

Final Report
July 2015

ctre
Center for Transportation Research and Education

Iowa State University
Institute for Transportation

Sponsored by
Iowa Department of Transportation
(Part of InTrans Project 13-480)

About CTRE

The mission of the Center for Transportation Research and Education (CTRE) at Iowa State University is to develop and implement innovative methods, materials, and technologies for improving transportation efficiency, safety, and reliability while improving the learning environment of students, faculty, and staff in transportation-related fields.

Disclaimer Notice

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the information presented herein. The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of the sponsors.

The sponsors assume no liability for the contents or use of the information contained in this document. This report does not constitute a standard, specification, or regulation.

The sponsors do not endorse products or manufacturers. Trademarks or manufacturers' names appear in this report only because they are considered essential to the objective of the document.

Non-Discrimination Statement

Iowa State University does not discriminate on the basis of race, color, age, religion, national origin, pregnancy, sexual orientation, gender identity, genetic information, sex, marital status, disability, or status as a U.S. veteran. Inquiries regarding non-discrimination policies may be directed to Office of Equal Opportunity, Title IX/ADA Coordinator and Affirmative Action Officer, 3350 Beardshear Hall, Ames, Iowa 50011, 515-294-7612, eooffice@iastate.edu.

Iowa Department of Transportation Statements

Federal and state laws prohibit employment and/or public accommodation discrimination on the basis of age, color, creed, disability, gender identity, national origin, pregnancy, race, religion, sex, sexual orientation or veteran's status. If you believe you have been discriminated against, please contact the Iowa Civil Rights Commission at 800-457-4416 or the Iowa Department of Transportation affirmative action officer. If you need accommodations because of a disability to access the Iowa Department of Transportation's services, contact the agency's affirmative action officer at 800-262-0003.

The preparation of this report was financed in part through funds provided by the Iowa Department of Transportation through its "Second Revised Agreement for the Management of Research Conducted by Iowa State University for the Iowa Department of Transportation" and its amendments.

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Iowa Department of Transportation or the U.S. Department of Transportation Federal Highway Administration.

Technical Report Documentation Page

1. Report No. Part of InTrans Project 13-480	**2. Government Accession No.**	**3. Recipient's Catalog No.**	
4. Title and Subtitle Iowa 511 Traveler Information System User Analysis		**5. Report Date** July 2015	
		6. Performing Organization Code	
7. Author(s) Anuj Sharma, Mo Zhao, Neal Hawkins, Peter Savolainen, and Skylar Knickerbocker		**8. Performing Organization Report No.** Part of InTrans Project 13-480	
9. Performing Organization Name and Address Center for Transportation Research and Education Iowa State University 2711 South Loop Drive, Suite 4700 Ames, IA 50010-8664		**10. Work Unit No. (TRAIS)**	
		11. Contract or Grant No.	
12. Sponsoring Organization Name and Address Iowa Department of Transportation 800 Lincoln Way Ames, IA 50010		**13. Type of Report and Period Covered** Final Report	
		14. Sponsoring Agency Code	
15. Supplementary Notes Visit www.intrans.iastate.edu for color pdfs of this and other research reports.			
16. Abstract This study provides the Iowa Department of Transportation (DOT) with a user analysis of the Iowa 511 Traveler Information System. The researchers assessed the Iowa 511 system using survey results and usage data. The system was evaluated by examining the trends in users, usage characteristics, and the use of competitors (e.g., traveler information systems from the private sector). The study resulted in a number of recommendations. Knowledge of how travelers utilize Iowa 511 will support short-term improvements and long-term programmatic decision making.			
17. Key Words Iowa 511—traveler information—user analysis		**18. Distribution Statement** No restrictions.	
19. Security Classification (of this report) Unclassified.	**20. Security Classification (of this page)** Unclassified.	**21. No. of Pages** 122	**22. Price** NA

Form DOT F 1700.7 (8-72) **Reproduction of completed page authorized**

IOWA 511 TRAVELER INFORMATION SYSTEM USER ANALYSIS

Final Report
July 2015

Principal Investigator
Neal Hawkins, Director
Center for Transportation Research and Education, Iowa State University

Co-Principal Investigator
Anuj Sharma, Research Scientist
Center for Transportation Research and Education, Iowa State University

Research Assistant
Mo Zhao

Authors
Anuj Sharma, Mo Zhao, Neal Hawkins, Peter Savolainen, and Skylar Knickerbocker

Sponsored by
the Iowa Department of Transportation
(Part of InTrans Project 13-480)

Preparation of this report was financed in part
through funds provided by the Iowa Department of Transportation
through its Research Management Agreement with the
Institute for Transportation

A report from
Institute for Transportation
Iowa State University
2711 South Loop Drive, Suite 4700
Ames, IA 50010-8664
Phone: 515-294-8103
Fax: 515-294-0467
www.intrans.iastate.edu

TABLE OF CONTENTS

ACKNOWLEDGMENTS vii
EXECUTIVE SUMMARY ix
Conclusions and Recommendations ix
INTRODUCTION 1
DATA SOURCES 3
Traveler Information System Survey–Motor Vehicle Division (MVD) 3
Web, App, and Phone User History 4
Traveler Information System Survey–Online 4
Precipitation and Snowfall Information 5
DATA ANALYSIS 7
Who Uses the 511 System? (Source: MVD Survey) 7
Who are the Competitors? (Source: MVD Survey) 10
How is Iowa 511 Being Used? (Sources: Google Analytics Web Logs and NWS COOP Historical Weather Data) 12
How Can 511 Support Travelers' Decisions? (Source: Online Survey) 25
USER FEEDBACK (SOURCES: MVD AND ONLINE SURVEYS) 27
What New Features on Iowa 511 are Needed? 27
What Improvements to Iowa 511 are Needed? 28
CONCLUSIONS AND RECOMMENDATIONS 30
REFERENCES 33
APPENDIX A: ANALYSIS OF ONLINE SURVEY 35
Users Statistics 35
Traveler Information Sources 35
APPENDIX B: STATISTICAL MODELING FOR IOWA 511 USERS 39
Binomial Probit Models 39
User Count Models 42
APPENDIX C: MVD SURVEY RESPONSE FREQUENCY TABLES 49
APPENDIX D: FEEDBACK FROM MVD SURVEY RESPONDENTS 75
APPENDIX E: ONLINE SURVEY RESPONSE FREQUENCY TABLES 81
APPENDIX F: FEEDBACK FROM ONLINE SURVEY RESPONDENTS 95
APPENDIX G: MVD SURVEY QUESTIONNAIRE 103
APPENDIX H: ONLINE SURVEY QUESTIONNAIRE 105

LIST OF FIGURES

Figure 1. Age distribution of MVD survey participants 3
Figure 2. Iowa 511 users by zip code (MVD survey) 4
Figure 3. Age distribution of online survey participants 5
Figure 4. NWS COOP weather station locations 6
Figure 5. Mediums used by Iowa 511 system users (204 of 850 respondents from MVD survey) 7
Figure 6. Iowa 511 feature usage by system users (204 of 850 respondents from MVD survey) 8
Figure 7. Traffic information services used by MVD survey respondents 10
Figure 8. Users of Iowa 511 websites and mobile app 13
Figure 9a. Iowa 511 websites and app usage during winter months 14
Figure 9b. Iowa 511 phone service usage during winter months 15
Figure 10. Time series plot of daily users across different Iowa 511 information mediums and cumulative snow depth 17
Figure 11. Modeled number of users and impact of precipitation and snowfall 18
Figure 12. Monthly elasticities for number of users on different Iowa 511 mediums 20
Figure 13. Percentage of devices in Iowa 511 website traffic 21
Figure 14. Iowa 511 website and mobile app users by city 23
Figure 15. Users of websites and mobile apps for 511 systems in Iowa, Minnesota, and Nebraska 24
Figure 16. Iowa 511 users by zip code (online survey) 25

LIST OF TABLES

Table 1. Correlation matrix for different Iowa 511 information mediums 16
Table 2. New features suggested for Iowa 511 by respondents 27
Table 3. Respondent suggestions to improve Iowa 511 29
Table A.1 Online survey respondent age groups 35
Table A.2. Websites used by online survey respondents 36
Table A.3. Mobile apps used by online survey respondents 36
Table A.4. Binomial probit model for predicting the probability of using Iowa 511 system 39
Table A.5. Binomial probit model for predicting the probability of using in-car navigation system 40
Table A.6. Binomial probit model for predicting the probability of using Google Maps 41
Table A.7. Model variables for the negative binomial models 42
Table A.8. NB model estimates for LB users 43
Table A.9. NB model estimate for HB users 44
Table A.10. NB model estimate for mobile web users 45
Table A.11. NB model estimate for App users 46
Table A.12. NB model estimate for phone users 47

ACKNOWLEDGMENTS

The authors would like to thank the Iowa Department of Transportation for sponsoring this research.

EXECUTIVE SUMMARY

This study assessed the Iowa 511 Traveler Information System using survey results and usage data for the 511 phone, websites, and mobile apps maintained by the Iowa Department of Transportation (DOT). The Iowa 511 system was evaluated by examining the trends in users, usage characteristics, and the use of competitors (e.g., traveler information systems from the private sector).

Conclusions and Recommendations

- Usage of the Iowa 511 system was highest during winter months and extreme weather events and Iowa 511 helps travelers plan their trips. After receiving information from Iowa 511, 66% of the 283 Iowa 511 users from the online survey respondents had changed their routes, 63% had changed their departure times, and 49% responded that Iowa 511 had helped them to be better prepared.

  Continue to focus on providing high quality traveler information during peak usage periods.

- Increased awareness about Iowa 511 could lead to increased usage. The Motor Vehicles Division (MVD) survey found that 4% of respondents (37 of 850) were not aware that Iowa 511 existed and only 24% of respondents had used Iowa 511.

  Marketing the Iowa 511 brand to help increase public awareness could potentially lead to increased usage.

- Those who commute within short distances close to home are likely to be more familiar and confident with their driving environments and possibly also have more flexible arrangements, which reduce the need to seek traveler information for Iowa DOT-maintained roadways. However, Iowa 511 currently does not cover county and local roads so it is probably less attractive to the commuters on local roadways.

  Increasing Iowa 511 information coverage and details could increase the market share.

- Traveler expectations are changing along with technology innovations. More than 50% of Iowa 511 web visits were made from mobile devices in the past two years. However, Iowa 511 was the only one providing phone service among all the traveler information providers used by MVD survey respondents. While the trend is to acquire traveler information through internet, 22% of those surveyed Iowa 511 users accessed Iowa 511 information by phone only.

  Regular user feedback and data-driven decision-making are quintessential for keeping up with changing needs and expectations.

- The MVD survey showed that primary competitors for overall usage were Google Maps and in-car navigation systems. Use of Google Maps was highest among the youngest driving ages (18 to 30), who were 38% more likely to use Google Maps than those over 60. In-car navigation systems tended to attract middle-aged users (31 to 40) and users with daily workday commute distances greater than two miles.

  It is important to understand the market share of the competing traveler information providers to better align the Iowa 511 system for optimal return on investment.

- Providing more camera images with higher quality and integration with other applications, such as WAZE, were the most desired features by current Iowa 511 users from the online survey. Both MDV and online survey respondents indicated that ease of use and accessibility as well as graphic design of the website and apps are important.

  Given the desired features/services by the MVD and online survey respondents, it is critical to provide reliable and real-time information, improve information coverage and details for a variety of public needs, integrate with other information services, disseminate information through the media that can reach a wide range of the target audience, and help ensure Iowa 511 distribution benefits users across significantly different geographic areas, incomes, ages, etc.

- The currently used Google Analytics provided several summaries of Iowa 511 web usage data, but limited flexibility in terms of the default queries, which restricted potential insights that could be gained from the data. The raw web logs could be used to develop improved analytical constructs. Other logs, such as the usage of roadway cameras and other specific tools, will be very helpful in future evaluations of the Iowa 511 Traveler Information System.

  This study demonstrated a need for better data gathering using improved web logging.

INTRODUCTION

Traveler information systems can provide travelers with details on the most efficient routes and motivate changes in traveler departure times to help them avoid congested conditions. On July 21, 2001, the Federal Communications Commission (FCC) designated 511 as the nationwide travel information telephone number. The Iowa Department of Transportation (DOT) launched the first stage of its 511 Traveler Information System, which included the 511 phone service and website, in 2002.

Iowa 511 provides real-time information on road traffic conditions, accidents, road closures, road construction, weather conditions, and other information of interest to the public. Currently Iowa 511 disseminates information to the public via phone service, websites, social networks, and mobile apps. Knowledge of how travelers utilize Iowa 511 will support short-term improvements and long-term programmatic decision making.

Numerous studies have found that traveler information systems can offer the benefit to the public in travel time savings, vehicle operating cost savings, crash cost savings, and vehicle emission reduction (Raine et al. 2014). For the DOTs, traveler information systems can save the operational costs incurred by direct inquiries from travelers (Deeter et al. 2014).

The potential disadvantage of traveler information systems is the audio and cognitive distractions if used by drivers while driving. A study by Patten et al (2004) found that audio and cognitive in-vehicle distractions can increase the time drivers focus on the center of the road and decrease their time scanning the wider road environment.

A study by the University of Minnesota makes recommendations for the next generation Minnesota 511 Traveler Information System, and the primary suggestion is to incorporate select features from traffic information applications developed by the private sector, such as voice commands, route guidance, saved places, and travel time estimates, while taking into account the cognitive workload and visual distraction (Morris et al. 2014). This study points out that the 511 system as a publicly funded traveler information system has a greater responsibility compared to the applications from the private sector to account for distraction and ensure the safety of system users.

In a National Cooperative Highway Research Program (NCHRP) report, the authors state the critical factors that affect the successful implementation of real-time traveler information systems are the collection of real-time transportation system status data and the delivery of this data in the form of information that can influence traveler decision making (Robinson et al. 2012). Regarding the future outlook of publicly funded traveler information systems, this research summarized the following perspectives based on a nationwide survey of transportation agencies in 2012:

- Partner more with the private sector
- Take advantage of smartphones and new social media
- Make sure funding is available for expansion

In a recent Federal Highway Administration (FHWA) report that reviewed 49 industry practices for the design, development, maintenance, and use of a road condition reporting system (RCRS), the authors identified three "emerging best practices": introducing citizen reporting into RCRSs, integrating transit data, and integrating third party tools (Deeter et al. 2014).

In November 2014, Iowa became the fourth state to integrate citizen reporting into its 511 system. Data from the private sector (e.g., Google) and other public entities (e.g., the National Weather Service) have also been adopted in Iowa 511. And additional Iowa 511 developments in data fusion and exchanges with the third parties are on the way to meet the public's needs.

This study assessed the Iowa 511 system using survey data and website usage statistics from Google Analytics. The system was evaluated by examining the trends in users, usage characteristics, and the use of competitors (e.g., traveler information systems from the private sector).

DATA SOURCES

Multiple data sources were used to gain insights into the usage of Iowa 511 within the state.

Traveler Information System Survey–Motor Vehicle Division (MVD)

Using input provided by the Iowa DOT and the research team, Iowa State University's Survey and Behavioral Research Services (SBRS) designed a survey questionnaire to gauge the usage of traveler information systems by Iowa road users. This Traveler Information System–Motor Vehicle Division (MVD) survey focused on awareness and usage of the Iowa 511 system.

The survey consisted of 22 questions, which addressed the sources for obtaining information on road construction and closures, weather-related delays, and travel times/routes and also included questions regarding driving patterns and basic demographics. (The survey questionnaire and responses are included in the appendices.)

Data were collected in driver's license stations in nine Iowa cities—Ankeny, Carroll, Cedar Rapids, Council Bluffs, Dubuque, Fort Dodge, Ottumwa, Mason City, and Spencer—representing both urban and rural areas.

A total of 850 participants responded to the survey. As shown in Figure 1, the survey respondents provide a reasonable sample of driver ages. Figure 2 shows the distribution of Iowa 511 users surveyed from the various cities. Response statistics are included in the appendices.

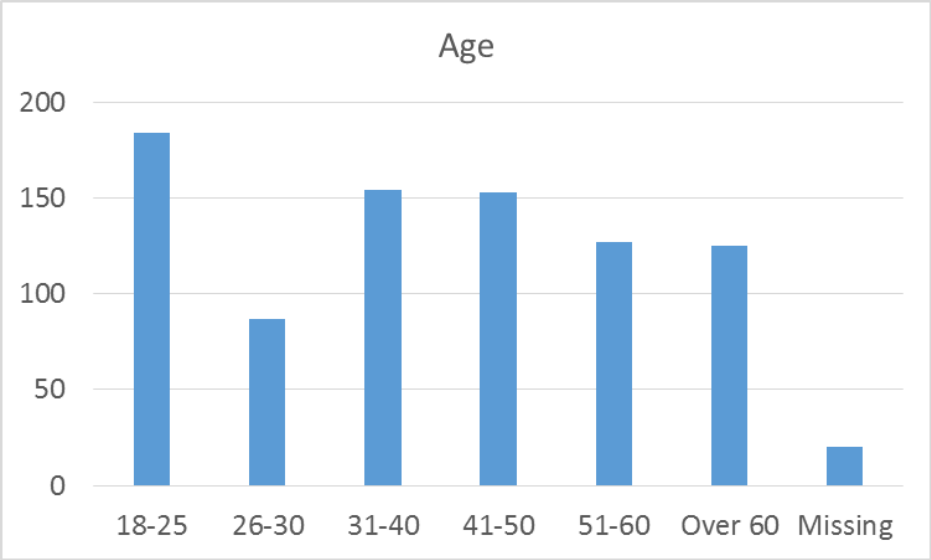


Figure 1. Age distribution of MVD survey participants

Figure 2. Iowa 511 users by zip code (MVD survey)

Web, App, and Phone User History

The Iowa 511 website and mobile apps include the low-bandwidth (LB) website, high-bandwidth (HB) website, mobile third generation (3G) website, Trucker website, and mobile apps (highway version and Truckers' version). Google Analytics was used to obtain data on the historical usage of these sites. The data were collected for four years from June 1, 2011 through May 31, 2015. The 511 phone call logs for the same period from Verizon were used to calculate Iowa 511 phone call statistics.

Traveler Information System Survey–Online

An online survey questionnaire similar to the MVD survey was delivered to current Iowa 511 users and Iowa DOT employees by email, and also posted on multiple online portals. The online survey was available starting May 20, 2015 and results were collected for this study until June 15, 2015. In total, 362 respondents, of which 296 were Iowa DOT employees, completed the survey during this timeframe. Figure 3 shows the age distribution of the participants.

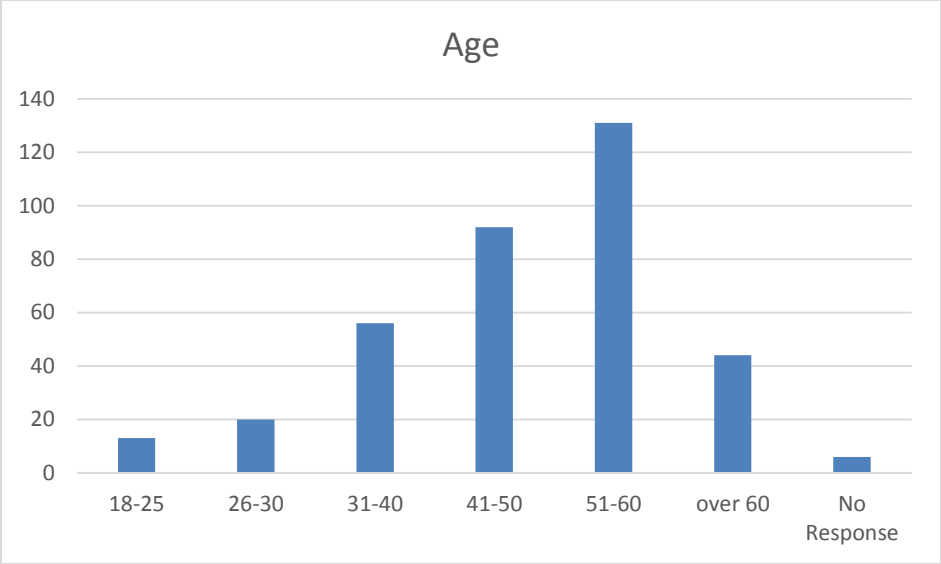


Figure 3. Age distribution of online survey participants

This dataset was not representative of the typical driving population and therefore was not used for statistical modeling. However, the responses and preliminary statistics are included in the appendices to highlight Iowa 511 usage, particularly among Iowa DOT employees.

Precipitation and Snowfall Information

The National Weather Service (NWS) Cooperative Observer Program (COOP) database was used to obtain historical snowfall and precipitation information. The data were collected from 118 sensors located across Iowa, as shown in Figure 4. Daily precipitation and snowfall data since January 1, 2013 were obtained for all 118 sensors.

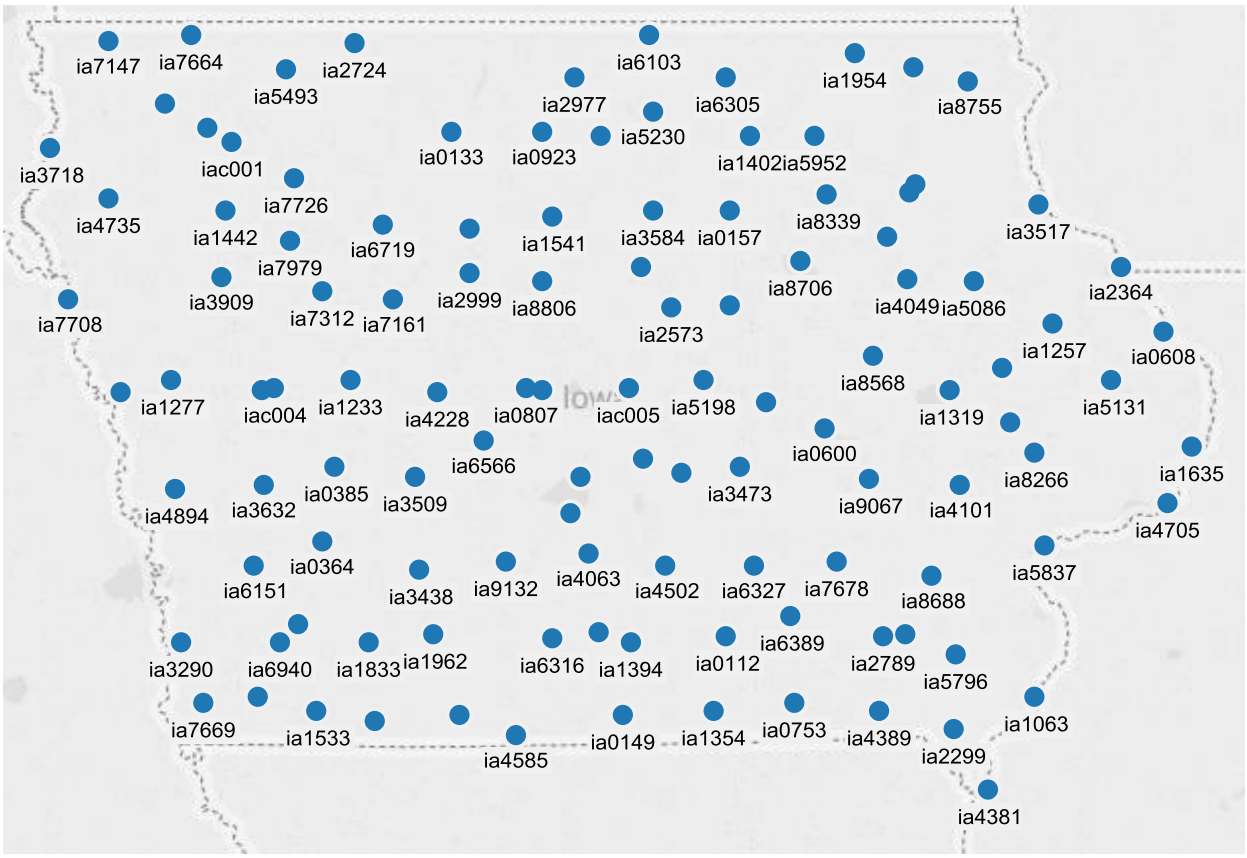


Figure 4. NWS COOP weather station locations

DATA ANALYSIS

Who Uses the 511 System? (Source: MVD Survey)

Characterization of Iowa 511 system users is important to better understand usage trends, allocate available development resources, and market the service. The question of who uses the Iowa 511 system was answered using the exploratory analysis and statistical models developed from the Traveler Information System Survey conducted at the nine MVD driver's license stations.

The MVD survey results showed the following:

- 19% (165/850) of respondents did not use any traveler information system during the six months prior to May 2015.
- 70% (598/850) of the respondents had never used Iowa 511.

Among the 204 respondents who had used Iowa 511 system:

- The websites (LB and HB) were the most frequently used information mediums.
- 51% (105/204) had visited Iowa 511 websites.
- 37% (76/204) had used the Iowa 511 phone service, and 22% (44/204) used only phone service.

The usage rate of each Iowa 511 information medium is shown in Figure 5.

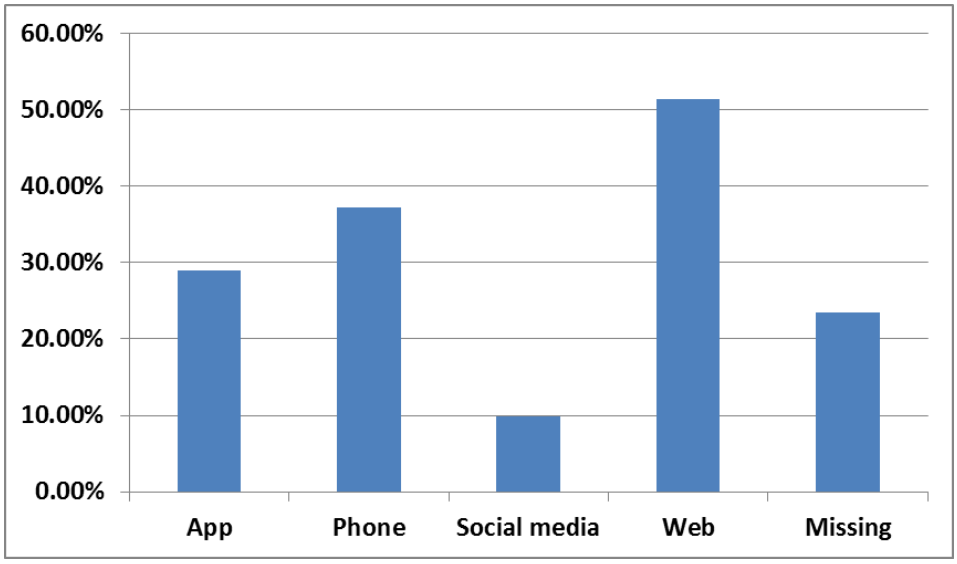


Figure 5. Mediums used by Iowa 511 system users (204 of 850 respondents from MVD survey)

These usage rates were calculated based on the usages of 204 Iowa 511 users from the MVD survey. The usage rates of the Iowa 511 apps and social media (Facebook and Twitter) were 29%

(59/204) and 10% (20/204), respectively. Among the 204 respondents who had used Iowa 511, the most frequently used feature was Road Report (81% or 165/204 users) as shown in Figure 6. The Road Report includes information on roadwork, closures, restrictions, and warnings. (The Iowa DOT also reported that, as of June 1, 2015, 4,574 Iowa 511 users had subscribed to the personalized road report service.)

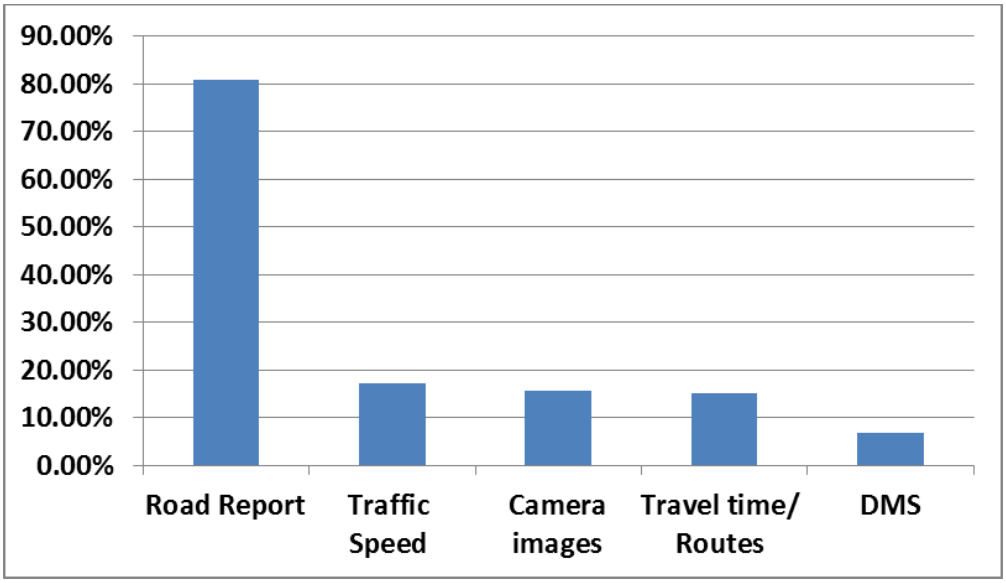


Figure 6. Iowa 511 feature usage by system users (204 of 850 respondents from MVD survey)

Other top used features from the MVD survey results were Traffic Speed (17% or 35/204 users), Camera Images (16% or 32/204 users), Travel Time/Routes (15% or 31/204 users), and Dynamic Message Sign (DMS) messages (7% or 14/204 users). These top used features are based on the respondents' reported usage of each feature during the six months prior to May 2015. With expanding feature availability, the usage rates might change over time; however, the significantly high usage of the Road Report indicates a majority of Iowa 511 users were motivated by the needs for road surface conditions, construction, and incident information, and potentially, Iowa 511 has an advantage over other applications in providing this information.

Statistical models were developed to examine the differences among Iowa 511 users versus the users of alternatives (e.g., Google Maps, Waze). (The details of the statistical modeling are included in the appendices.) Several factors, such as age, commute distance, and city location, were examined to ascertain differences in use among various segments of the driving population.

The statistical analysis showed age and commute distance to possibly be determinants of those choosing to use the Iowa 511 system. Travelers aged 31 to 60 and those with daily commute distances greater than two miles were more likely to use Iowa 511. Compared to the other age groups, travelers aged 31 to 60 were 9.5% more likely to use Iowa 511 over other travel information systems. Travelers who commute more than two miles were 7.8% more likely to use

Iowa 511. The potential reasons for usage characteristics as found by the model can be the following:

- Those who commute within short distances close to home are familiar and confident with their driving environments and possibly have more flexible arrangements, which reduce the need to seek traveler information for Iowa DOT-maintained roadways.
- Iowa 511 currently does not cover county and local roads so it is less attractive to the commuters on local roadways.
- There are no national standards for developing real-time traveler information systems so the implementation of the 511 system can be different, which requires interstate travelers to adjust as they travel from one jurisdiction to another. Some other traveler information systems, such as Google Maps and in-car navigation systems, are more user-friendly in this way when traveling nationwide.

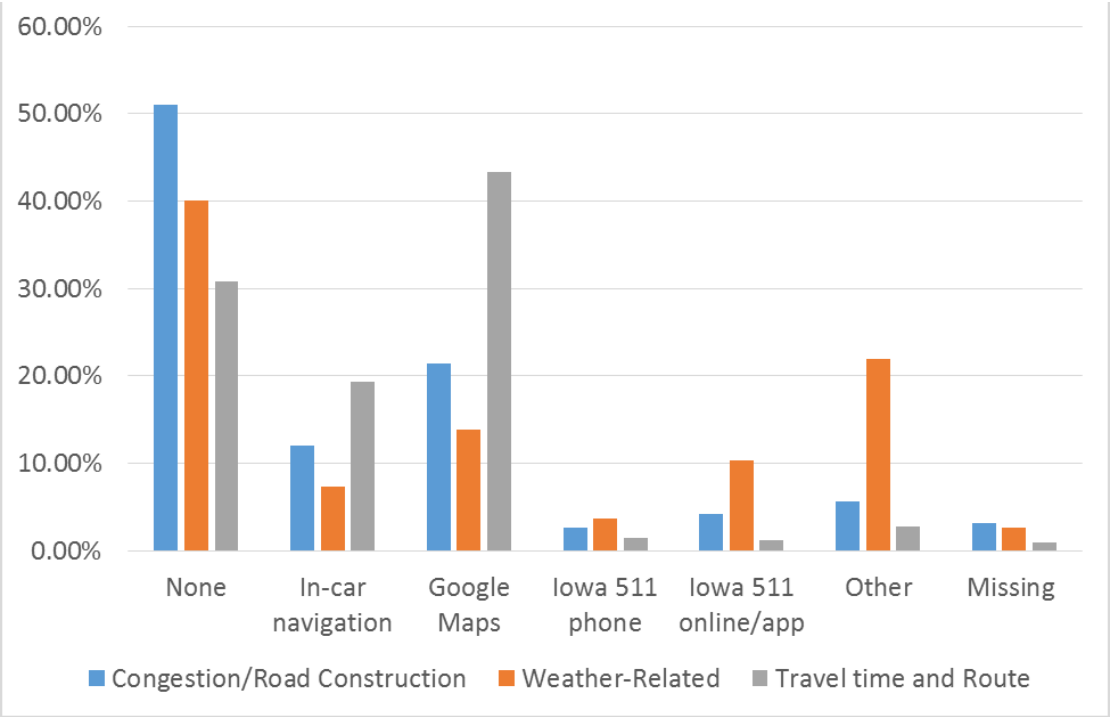
In the statistical analysis, no consistent trends were exhibited with respect to the Iowa cities where the MVD surveys were conducted. This implies that, for the same age group and commute distance, the users sampled from all nine MVD sites were equally likely to use Iowa 511.

Insights

- 19% of surveyed population did not use any traveler information system during the past six months prior to May 2015
- 24% of respondents had used Iowa 511
- Use of Iowa 511 was 9% more likely among those aged 31 to 60 and also more likely among those with weekday commute distances more than two miles
- No significant differences in the usage rates of Iowa 511 across the surveyed MVD sites
- Increasing Iowa 511 information coverage and details, such as the information on major arterials not maintained by the state, could increase the market share

Who are the Competitors? (Source: MVD Survey)

It is important to understand the market share of the competing traveler information providers to better align the Iowa 511 system for optimal return on investment. The MVD survey data were used to describe the role of competitors to Iowa 511. The traveler information systems used by the respondents are shown in Figure 7.



Other: TV/News (2%, 11.18%, 0.59%); Radio (1.88%, 2.59%, 0.12%); Phone apps other than 511 (0.82%, 4.24%, 1.06%)

Figure 7. Traffic information services used by MVD survey respondents

For congestion, road construction, and closure information:

- Nearly half (49%) of the respondents had sought this information in the six months prior to May 2015, mostly from Google Maps (24% or 182/850) or in-car navigation (12% or 102/850).

For weather-related traveler information:

- About 60% (588/850) of respondents had sought weather-related travel information in the six months prior to May 2015.
- Respondents mainly used information from TV, radio, and phone apps other than 511.
- Most respondents checked weather-related information before a trip (33% or 286/850) or en route (15% or 126/850).

For travel time information:

- About 69% (588/850) of respondents had sought travel time information in the six months prior to May 2015.
- Google Maps was most frequently used for travel time information.
- Travelers generally check travel time before a trip (33% or 262/850) or en route (30% or 282/850).

Statistical analyses showed that Google Maps captures a larger market share in traveler information seekers between 18 and 30 years old. Respondents in this age group are 38% more likely to use Google Maps. Also, compared to the respondents over 60 years old, the usage rate of Google Maps was 25% higher among those 31 to 40, 20% higher among those 41 to 50, and 14% higher among those 51 to 60.

The probability of using in-car navigation systems was also found to be related to age group and commute distance. People between the ages of 31 and 40 were 9% more likely to use in-car navigation systems, while those with daily commute distances greater than two miles were 7% more likely to use in-car navigation systems. (Details about the statistical modeling are included in the appendices.)

Compared to Google Maps and in-car navigation systems, Iowa 511 provides both current and future road construction and closure information, and it integrates Google traffic speed.

The MVD survey respondents reported that ease of use, followed by the accuracy of information, were the most critical factors affecting their choice of a specific traveler information system. To increase Iowa 511 users, the system needs to disseminate information in the form expected by travelers, and also consider the different needs for commuters, local travelers, tourists, long-distance travelers, and commercial-vehicle operators. Marketing the 511 brand to help increase public awareness about Iowa 511 could potentially lead to increased usage.

The MVD survey showed Iowa 511 is the only one providing a phone service among all the traveler information providers used by the respondents. For 22% of Iowa 511 users, the phone service is the only 511 information medium they used.

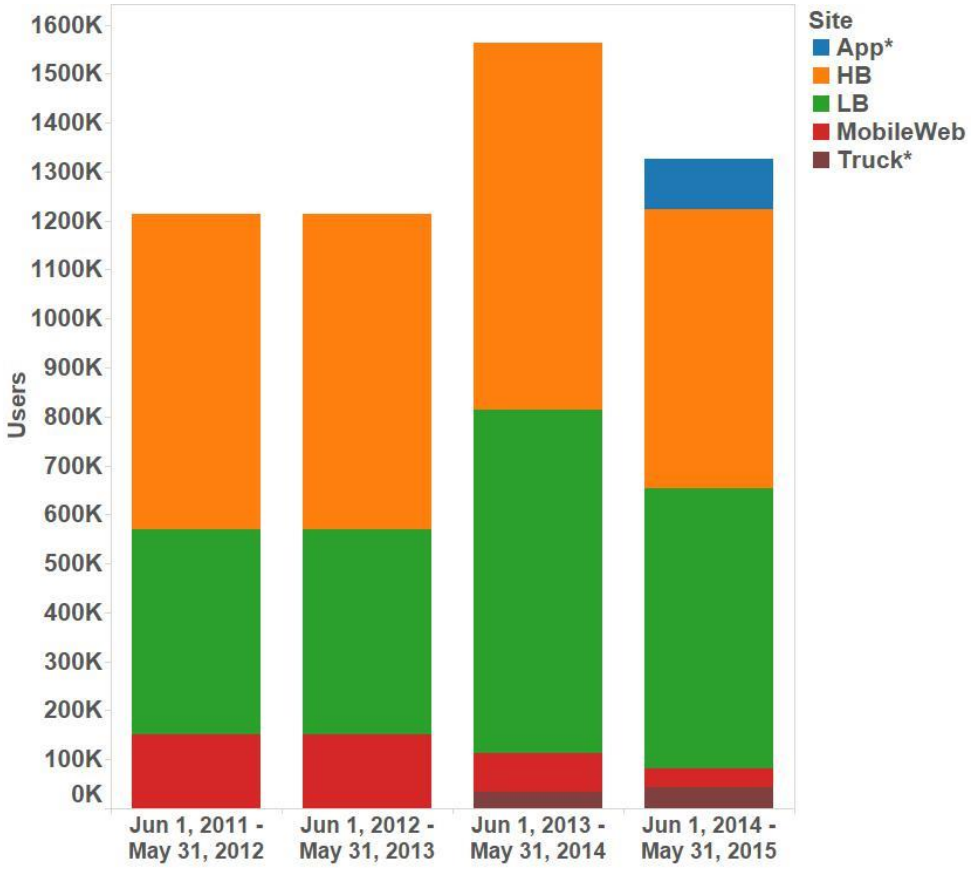
Studies in literature also found that the reliability of information affected whether the traveler would pay attention to the advice from a traveler information system (Ben-Elia et. al. 2013). As a publicly funded traveler information system provided by the Iowa DOT, Iowa 511 may have a strong advantage over its competitors in collecting and maintaining high quality data from multiple sources. By ensuring the accuracy and timeliness of information, Iowa 511 can build and maintain public trust and fulfill the benefits of a statewide traveler information provider and partner.

Insights

- Primary competitors for overall usage were Google Maps and in-car navigation systems
- Use of Google Maps was highest among the youngest driving ages (ages 18 to 30), who were 38% more likely to use Google Maps than those over 60 years old
- In-car navigation systems tended to attract middle-aged users (31 to 40) and users with daily commute distances greater than two miles
- Iowa 511 is the only one providing phone service among all the travel information providers used by the respondents and, while the trend is to acquire traveler information through internet websites, 22% of those surveyed Iowa 511 users access 511 information by phone only

How is Iowa 511 Being Used? (Sources: Google Analytics Web Logs and NWS COOP Historical Weather Data)

Iowa 511 disseminates information on the internet through the low-bandwidth (LB) website, high-bandwidth (HB) website, mobile 3G website, mobile app, and social media (Facebook and Twitter). As of May 31, 2015, the Iowa 511 websites and mobile apps have served an average of about 4,000 users each day over the past two years, and each web visit lasts for an average of about 2.6 minutes. The LB and HB websites were most frequently visited. Figure 8 shows the total users for each 12-month period from June 2011 through May 2015.

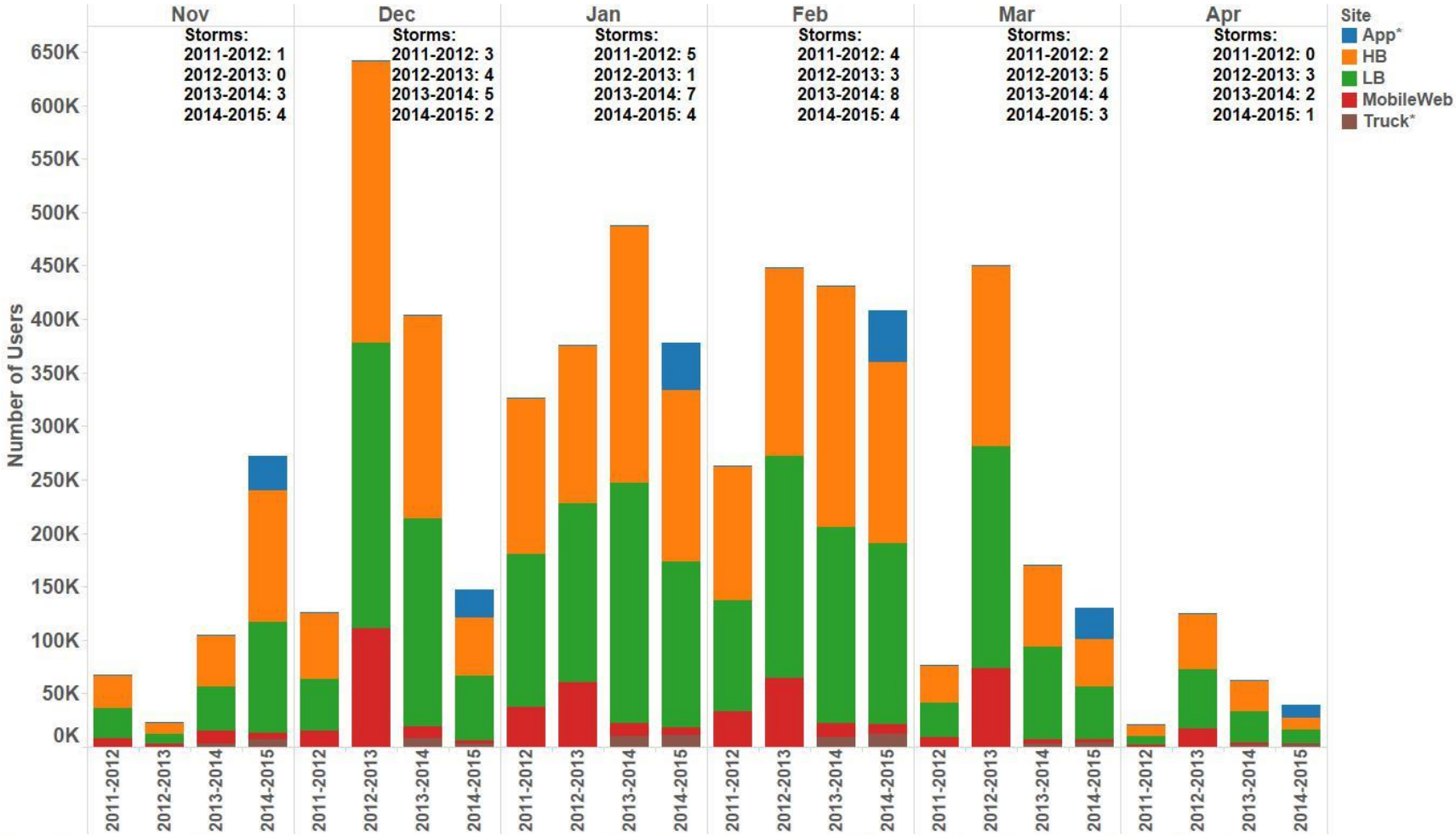


*No data for mobile apps before June 2014 or for Trucker's site before September 2013

Figure 8. Users of Iowa 511 websites and mobile app

One user was defined as a web visitor that had at least one visit within the selected date range. The Iowa 511 Trucker's site and mobile apps were released in June 2012 but the web logs were not available until September 2013 and June 2014, respectively. Compared to the 2013-2014 period, the total number of websites users decreased by roughly 10.7% in the 2014-2015 period. Some of it might be attributed to a less severe winter. The users of Iowa 511 in the past four winters are shown in Figures 9a and 9b.

January and February were the peak months for both 511 websites and phone usage, while the most usage occurred in December 2012 during which two storms brought a swath of 8- to 12-inch snows across Iowa and other states in the Midwest. The number of Iowa 511 users seems related to the frequency and severity of winter storms.



*No data for mobile app before June 2014 and Trucker's site before September 2013

Figure 9a. Iowa 511 websites and app usage during winter months

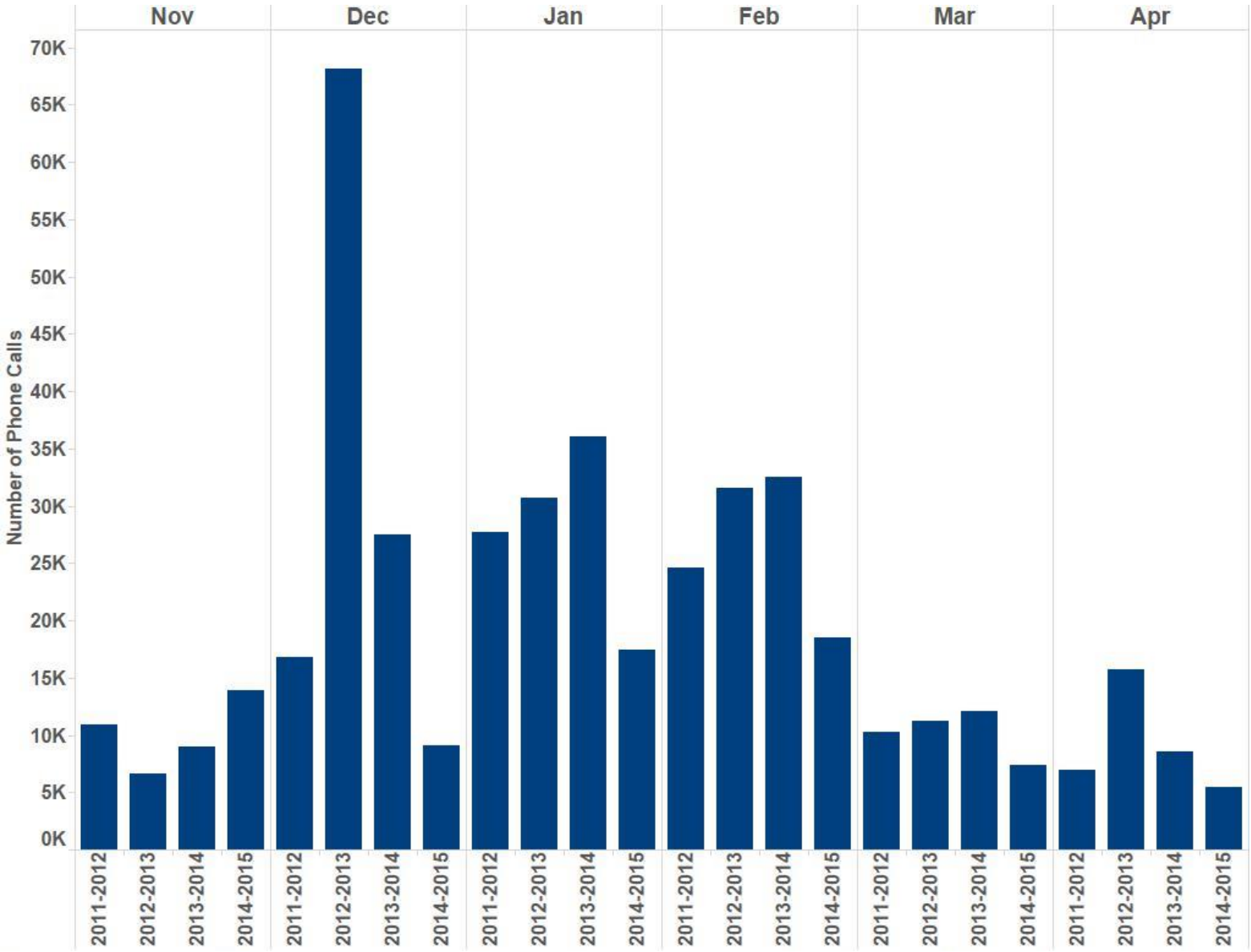


Figure 9b. Iowa 511 phone service usage during winter months

Statistical Analysis

The following statistical analysis provides some insights into how Iowa 511 usage corresponds to precipitation and snowfall. To identify the trend in Iowa 511 usage, long-term data gathering is needed.

Very high correlation was observed across all forms of 511 information dissemination. The correlation coefficients between each website/app with others are shown in Table 1, where the values from zero to one indicate no correlation to total positive correlation.

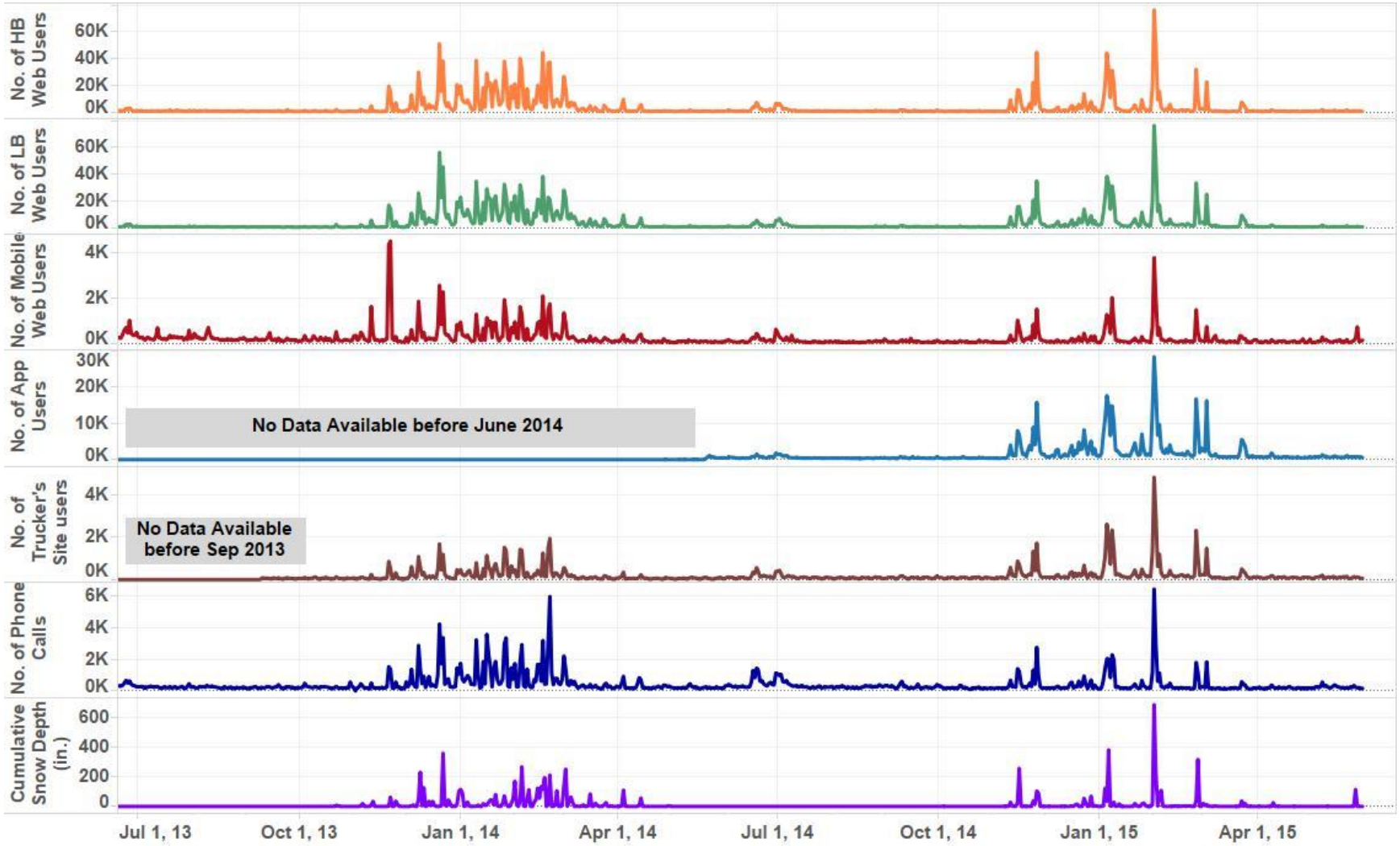
Table 1. Correlation matrix for different Iowa 511 information mediums

	LB	**HB**	**Mobile Web**	**App**	**Phone**
LB	1.00	0.99	0.95	0.98	0.94
HB	0.99	1.00	0.95	0.96	0.94
Mobile Web	0.95	0.95	1.00	0.90	0.95
App	0.98	0.96	0.90	1.00	0.87
Phone	0.94	0.94	0.95	0.87	1.00

Scale: 0 = no correlation and 1 = total positive correlation

The high correlation coefficients imply that the usage of all Iowa 511 mediums simultaneously peaks. As an example, the usages of all websites and the phone service increase during a severe winter storm. The historical data showed that snow and winter months are the primary cause of the increase in usage for all Iowa 511 information disseminating mediums. The daily usage of Iowa 511 online and phone services from June 2013 to May 2015, as well as the snow depth accumulated at the 118 NWS COOP weather stations (Figure 4), are shown Figure 10.

The Iowa 511 usage spikes of all information mediums simultaneously occurred on days with heavy snow, as shown in Figure 10. Usage is relatively stable during the seasons other than winter, and the flooding in Iowa during the summer of 2014 could be the reason for the summer month increases seen last year.



Cumulative snow depth and precipitation are the total amount observed at all 118 weather stations shown in Figure 4.
The increased usages seen in summer months are possibly related to the flooding conditions.

Figure 10. Time series plot of daily users across different Iowa 511 information mediums and cumulative snow depth

Statistical models were developed to better understand the factors contributing to the usages of Iowa 511 phone, websites, and mobile apps from June 2013 to May 2015. The statistical models compared the numbers of daily users in each month to a base case scenario, which was the number of users on an average day of June 2013 with no precipitation or snowfall. The users in the base scenario and the elasticities for precipitation and snowfall are shown in Figure 11. (The detailed modeling results are included in the appendices.)

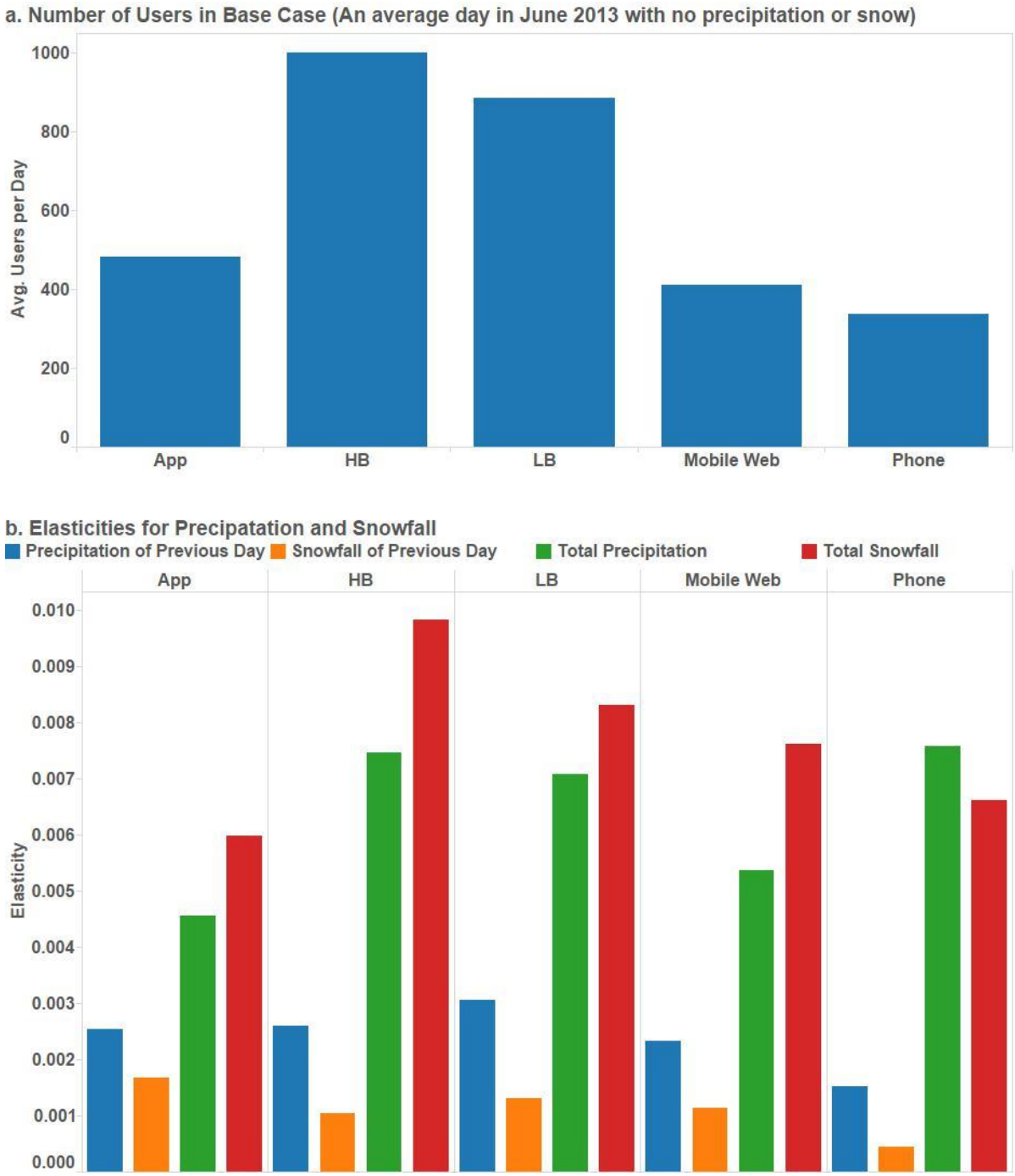


Figure 11. Modeled number of users and impact of precipitation and snowfall

The precipitation and snow impacts are measured by elasticity. The elasticity is a measure of responsiveness in Iowa 511 usages (or demand for use of Iowa 511) to a change in a relevant factor. As an example, a unit elasticity for snowfall will imply that the number of users increases by 1 unit if the snowfall is increased by a unit.

The top graph in Figure 11 shows the number of Iowa 511 users in the base scenario of a summer day without any precipitation. Both rain and snowfall increase the usage significantly, as indicated by the elasticities shown in the bottom graph in Figure 11. Moreover, the snowfall and precipitation from the previous day are also found to have an impact on the usage rates. It should be noted that even though elasticities for total precipitation are low, a widespread snowfall can quickly increase the number of users. As an example, an inch of snow across all 118 sensors can lead to a 94% increase in LB users.

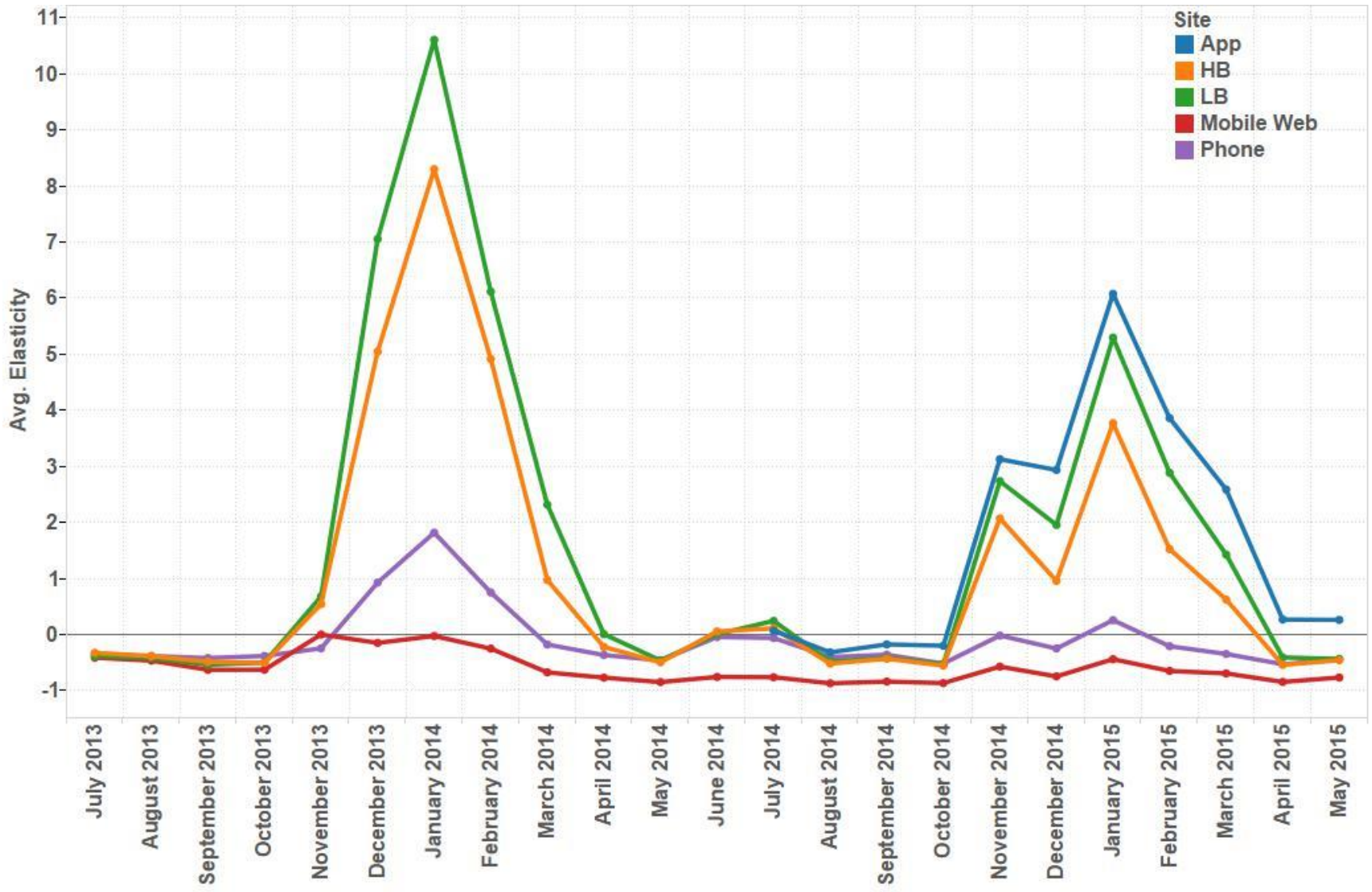
Figure 12 compares the usage of Iowa 511 by month after accounting for the changes caused by snowfall and precipitation. Again, the number of users in an average day in June 2013 is used as the base scenario to compare with the other months. In this figure, the increases in usage due to snowfall and precipitation are not represented.

Note that winter months have higher usage than other months, the month of January in particular (for both years shown) had the highest usage, even though the effects of precipitation and snowfall were not factored in on this part of the analysis. This could imply users are generally more concerned with traveler information during winter months, and thus, check the road conditions more regularly.

Compared to the other 511 information mediums, the increase of users during winter months is significantly lower for phone service and the mobile 3G website. When compared to the winter months of 2013-2014, a reduction in HB and LB website users was seen for the winter months of 2014-2015, which could be partially due to the fact that the winter of 2014-2015 was relatively milder than the preceding year.

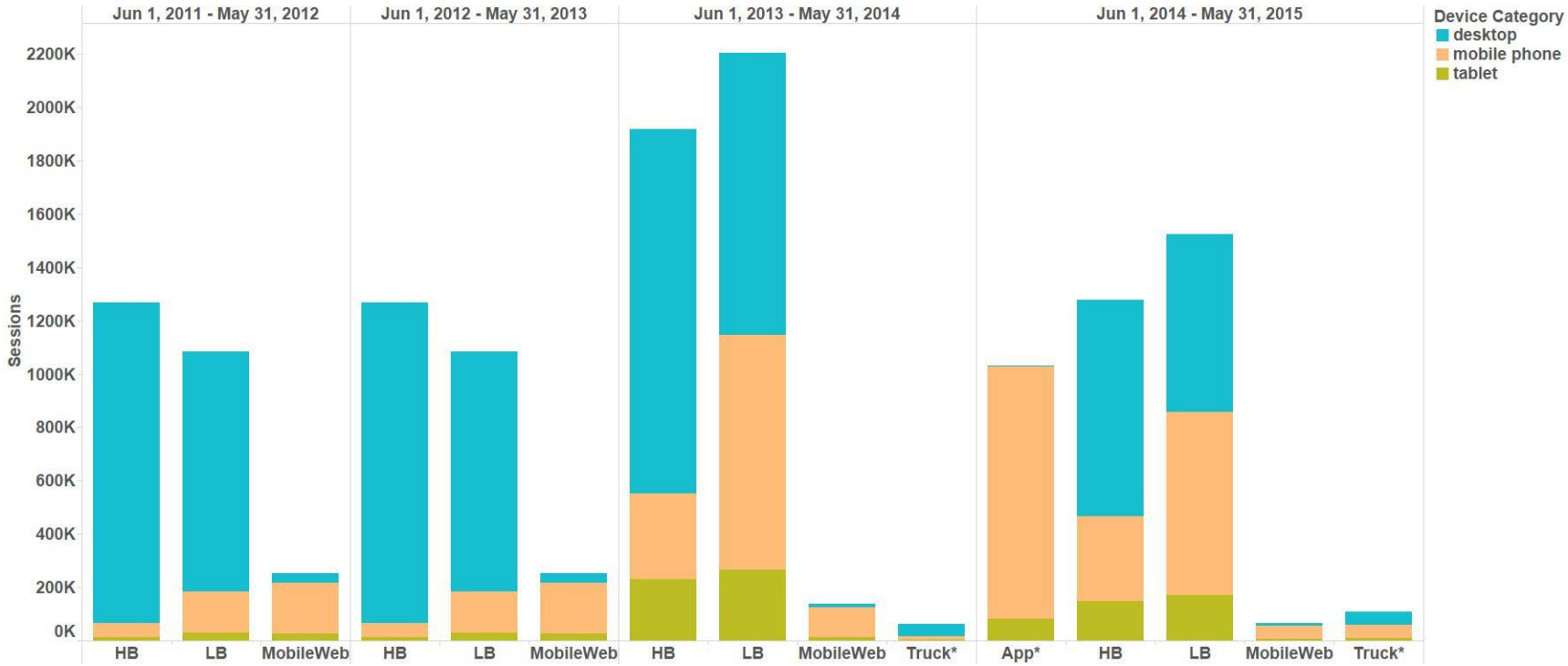
No data were available to compare the usage of the 511 mobile apps to the previous year; however, with the wide usage of smartphone and other mobile devices in the past few years, it becomes increasingly important to disseminate information through mobile apps and social media outlets. Figure 13 shows, in the past two years, more than 50% of web sessions came from mobile devices (phone and tablets). A session is the time period a user is actively engaged with the website or app, and it can be seen as a visit to the Iowa 511 website.

In addition to disseminating information to the public, Iowa 511 social media (via Facebook and Twitter) could be used as a tool for crowdsourcing. A survey conducted by the University of Texas at Austin found that 38% of survey respondents were willing to share dynamic traffic incident information with their social media groups, and when a transportation information hub was created on Facebook, it was well received (Qiao et al. 2011).



The elasticities here reflect the changes in users without the impacts of precipitation and snowfall.

Figure 12. Monthly elasticities for number of users on different Iowa 511 mediums



*No data for mobile apps before June 2014 or Trucker's site before September 2013

Figure 13. Percentage of devices in Iowa 511 website traffic

Comparison to Other States

The majority of Iowa 511 users were from Iowa, and Des Moines had more users overall and particularly June 2013 through May 2014, even without including usage results for Urbandale and West Des Moines. Figure 14 shows the 12 cities that had the most Iowa 511 users.

Iowa 511 out-of-state users were mostly from Chicago, Illinois; Minneapolis, Minnesota; and Omaha, Nebraska. To compare Iowa 511 with the 511 services from these neighboring states, Google Analytics web log data for Minnesota and Nebraska 511 systems were obtained and compared to Iowa 511 web log data. Given that Nebraska 511 data were only available from late September 2014, the data from October 2014 through May 2015 were used in this comparison.

Figure 15 shows the users of the three 511 systems from October 2014 through May 2015. Note that the Minnesota and Nebraska 511 systems do not have separate websites and apps for truckers like the Iowa 511 system does.

The three states shared the same general trend in monthly usage with November through February as peak usage periods, although Nebraska 511 had considerably fewer users than Iowa 511 and Minnesota 511 year round. Iowa 511 had the most users in January and February 2015, and Minnesota 511 had the most users in October and December of 2014 and March, April, and May of 2015.This might be related to more winter storms and other severe weather events in Minnesota than in Iowa during those months.

Insights

- Significant increases in Iowa 511 website usage were found during the winter months. This trend was consistent across all Iowa 511 information dissemination mediums. LB and HB website usage peaked in January with increases of 4% to 11% in web traffic.

- Precipitation and snowfall events were found to significantly affect usage of Iowa 511. Statistical analyses of Iowa 511 web traffic and historical weather data showed that, for a statewide storm with an average of one inch of snow for each of the 118 weather stations across Iowa, the 511 usage increased by 70% to 118% beyond the already increased usage during the winter months.

- More than 50% of Iowa 511 web visits originated from mobile devices in the two years prior to May 2015.

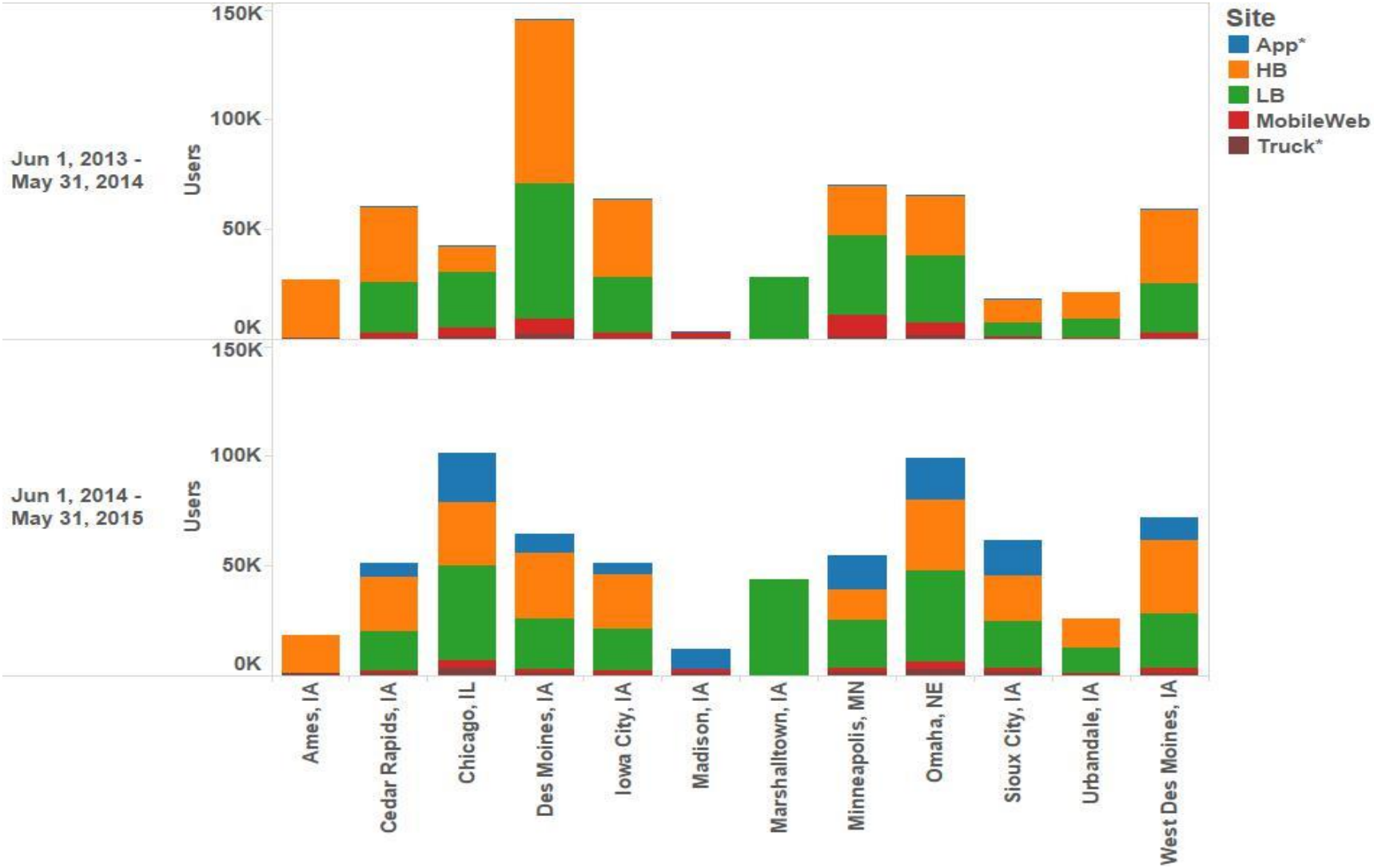


Figure 14. Iowa 511 website and mobile app users by city

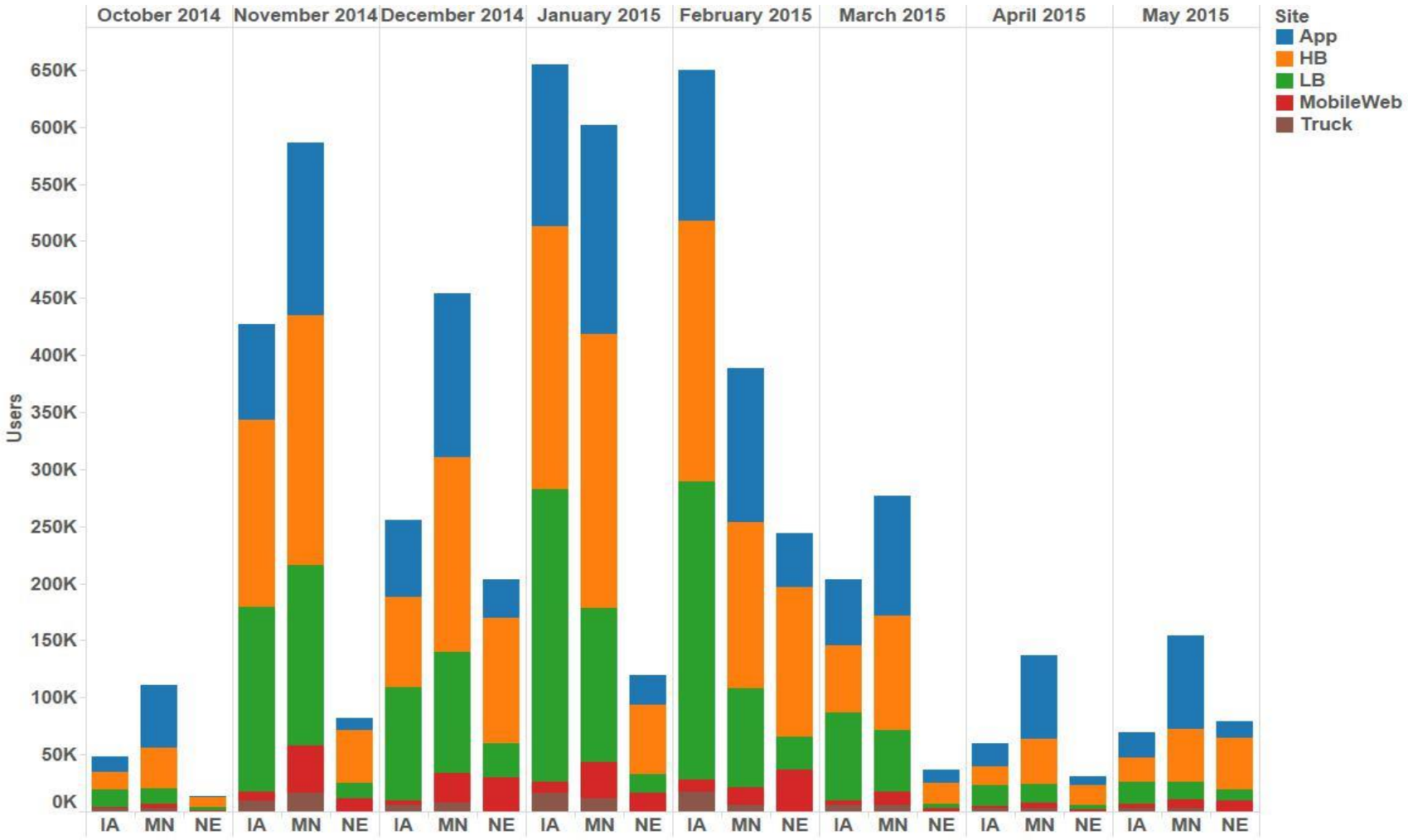


Figure 15. Users of websites and mobile apps for 511 systems in Iowa, Minnesota, and Nebraska

How Can 511 Support Travelers' Decisions? (Source: Online Survey)

The online survey was designed for current Iowa 511 users. About 78% (283/362) of survey respondents had used Iowa 511. The spatial distribution of these users is shown in Figure 16.

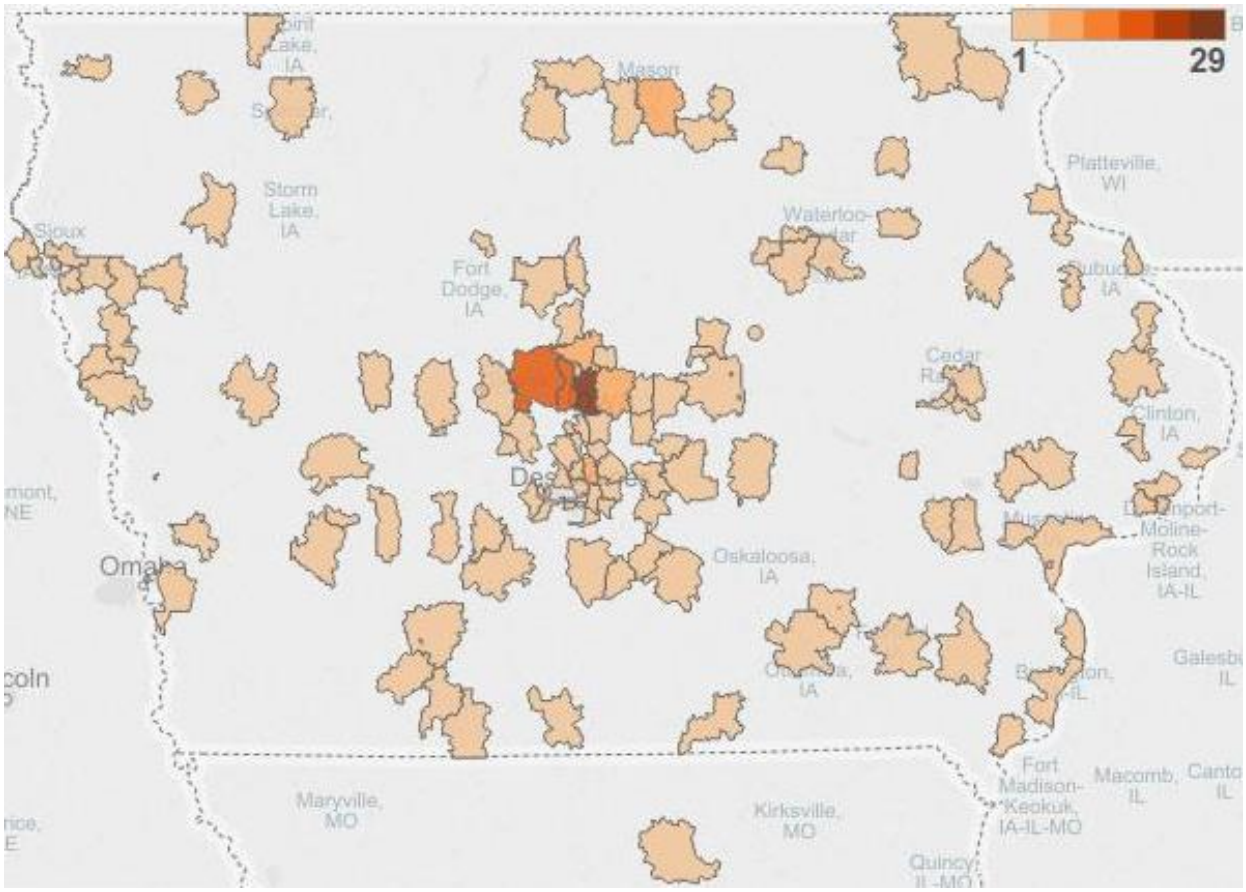


Figure 16. Iowa 511 users by zip code (online survey)

Users from Ames and Boone accounted for 16% and 7%, respectively, as most users completing the survey were employees of the Iowa DOT located in Ames.

Among the 61 non-Iowa DOT respondents:

- About 83% (51/61) had used Iowa 511 and 72% (44/61) used more than one information medium of Iowa 511.
- Iowa 511 websites and apps were the most used media, followed by Iowa 511 Twitter and Facebook.
- About 64% of Iowa 511 users (32/51) commute between two cities. A daily weekday commute longer than two miles appeared to encourage use of Iowa 511.

Iowa 511 helps travelers plan their trips before departure and provides real-time information en route. For the 283 Iowa 511 users in the online survey, Iowa 511 had the most impact on their route choices and departure times:

- 66% (186/283) had changed the route for their trips.
- 63% (178/283) had changed their departure times.
- 49% (138/283) responded that Iowa 511 had helped them to better prepare for their trips.

Insights

- Iowa 511 helps travelers plan their trips and provides real-time information en route. The online survey showed that, after receiving information from Iowa 511, 66% of users had changed their route, 63% had changed their departure times, and 49% responded that Iowa 511 had help them to better prepare for their trips.

USER FEEDBACK (SOURCES: MVD AND ONLINE SURVEYS)

Through the MVD survey and the online survey, respondents were asked to provide comments on the current Iowa 511. About 15% of the MVD survey respondents and 20% of online survey respondents provided feedback. Among the 126 respondents who provided feedback through the MVD survey, 37 (or 29%) were unware of any Iowa 511 services.

What New Features on Iowa 511 are Needed?

The desired features/services by the respondents are summarized in Table 2.

Table 2. New features suggested for Iowa 511 by respondents

MVD Survey			Online Survey		
Comments	**Frequency**	**Percentage**	**Comments**	**Frequency**	**Percentage**
Don't know 511-Advertising	37	4.35%	**None**	19	5.26%
Not sure	19	2.24%	**More Cameras**	8	2.22%
Phone App**	7	0.82%	**Integrating with other services**	8	2.22%
Weather/traffic/road conditions**	4	0.47%	**Construction Updates****	7	1.94%
Rest Area Locator**	4	0.48%	**Other**	6	1.66%
None	3	0.35%	**Not sure**	5	1.39%
Alternative Routes	2	0.24%	**Weather Updates****	4	1.11%
Delay Updates*	2	0.24%	**Delay Updates***	3	0.83%
Emergency services	1	0.12%	**Simplify**	3	0.83%
Exit lane locator	1	0.12%	**Traffic Updates on local arterials**	3	0.83%
Identify police officer location	1	0.12%	**Alternative Routes****	2	0.55%
Information signs on roads**	1	0.12%	**Rideshare and Public Transport Information**	2	0.55%
Integrate different services	1	0.12%	**Alerts signup****	1	0.28%
Aerial maps of cities	1	0.12%	**Phone Options****	1	0.28%
Quick reference guide how to link	1	0.12%	**More frequent updates**	1	0.28%
Simplify	1	0.12%	**Text Alert****	1	0.28%
Call back	1	0.12%	**Traffic Incident Alerts****	1	0.28%
			RV Routes	1	0.28%
			Travel Time Updates**	1	0.28%

****Existing features**
***Coming soon**

Due to the lack of knowledge of current Iowa 511, some MVD survey respondents suggested features that were already provided, such as a phone app and weather/traffic/road conditions.

This indicated the existence of uninformed potential users. Marketing could be used to potentially capture this audience and enhance the awareness of Iowa 511. Providing more camera images with higher quality and integration with other applications, such as WAZE, were the most desired features by current Iowa 511 users from the online survey.

What Improvements to Iowa 511 are Needed?

Table 3 lists the comments from respondents for improving Iowa 511.

Iowa 511 should be designed to encourage usage by travelers of all driving ages. To induce additional users, Iowa 511 should improve ease of use, be easily accessible, and have good graphic design. To continue attracting current users, it is critical to provide reliable and real-time information, improve information coverage and details for a variety of public needs, integrate with other information services, and disseminate information through the media that can reach a wide range of the target audience. Also, as a publicly funded traveler information system, Iowa 511 should be sure to provide benefits across different geographic areas, incomes, ages, etc.

Insights

- Providing more images with higher quality and integration with other applications, such as WAZE, were the most desired features by current Iowa 511 users from the online survey.
- It is critical to provide reliable and real-time information, improve information coverage and details for a variety of public needs, integrate with other information services, disseminate information through the media that can reach a wide range of the target audience, and ensure Iowa 511 distribution benefits users across significantly different geographic areas, incomes, ages, etc.

Table 3. Respondent suggestions to improve Iowa 511

MVD Survey			Online Survey		
Comments	**Frequency**	**Percentage**	**Comments**	**Frequency**	**Percentage**
Advertising	27	3.18%	**None**	24	6.65%
Not sure	15	1.76%	**Construction Updates****	9	2.49%
None	11	1.29%	**More Frequent Updates**	8	2.22%
Simplify it	3	0.35%	**Not sure**	5	1.39%
Phone App**	2	0.24%	**Advertising**	3	0.83%
Text Alerts**	2	0.24%	**Integrate with other services**	3	0.83%
App not work sometime	1	0.12%	**Better quality cameras**	2	0.55%
Apps/Maps/ Phone Alerts**	1	0.12%	**Increase Bandwidth**	2	0.55%
Ease access for all phones	1	0.12%	**Ridesharing/Public Transportation**	2	0.55%
Call Back	1	0.12%	**Real Time Information**	2	0.55%
Different Languages	1	0.12%	**Rideshare and Public Transport Information**	2	0.55%
Make it convenient	1	0.12%	**Simplify it**	2	0.55%
Multi state maps	1	0.12%	**Weather Updates****	2	0.55%
Problem with dynamin messages-being offensive	1	0.12%	**DMS information****	1	0.28%
Remove it	1	0.12%	**More Details**	1	0.28%
Weather/traffic/ road condition updates**	1	0.12%	**Phone Option****	1	0.28%
			Reduce Clutter	1	0.28%
			Remove It	1	0.28%
			Other	1	0.28%
			Large and fast camera views	1	0.28%
			Improve website formatting	1	0.28%

****Existing feature**

CONCLUSIONS AND RECOMMENDATIONS

- Usage of the Iowa 511 system was highest during winter months and extreme weather events and Iowa 511 helps travelers plan their trips. After receiving information from Iowa 511, 66% of the 283 Iowa 511 users from the online survey respondents had changed their routes, 63% had changed their departure times, and 49% responded that Iowa 511 had helped them to be better prepared.

  Continue to focus on providing high quality traveler information during peak usage periods.

- Increased awareness about Iowa 511 could lead to increased usage. The Motor Vehicles Division (MVD) survey found that 4% of respondents (37 of 850) were not aware that Iowa 511 existed and only 24% of respondents had used Iowa 511.

  Marketing the Iowa 511 brand to help increase public awareness could potentially lead to increased usage.

- Those who commute within short distances close to home are likely to be more familiar and confident with their driving environments and possibly also have more flexible arrangements, which reduce the need to seek traveler information for Iowa DOT-maintained roadways. However, Iowa 511 currently does not cover county and local roads so it is probably less attractive to the commuters on local roadways.

  Increasing Iowa 511 information coverage and details could increase the market share.

- Traveler expectations are changing along with technology innovations. More than 50% of Iowa 511 web visits were made from mobile devices in the past two years. However, Iowa 511 was the only one providing phone service among all the traveler information providers used by MVD survey respondents. While the trend is to acquire traveler information through internet, 22% of those surveyed Iowa 511 users accessed Iowa 511 information by phone only.

  Regular user feedback and data-driven decision-making are quintessential for keeping up with changing needs and expectations.

- The MVD survey showed that primary competitors for overall usage were Google Maps and in-car navigation systems. Use of Google Maps was highest among the youngest driving ages (18 to 30), who were 38% more likely to use Google Maps than those over 60. In-car navigation systems tended to attract middle-aged users (31 to 40) and users with daily workday commute distances greater than two miles.

  It is important to understand the market share of the competing traveler information providers to better align the Iowa 511 system for optimal return on investment.

- Providing more camera images with higher quality and integration with other applications, such as WAZE, were the most desired features by current Iowa 511 users from the online survey. Both MDV and online survey respondents indicated that ease of use and accessibility as well as graphic design of the website and apps are important.

  Given the desired features/services by the MVD and online survey respondents, it is critical to provide reliable and real-time information, improve information coverage and details for a variety of public needs, integrate with other information services, disseminate information through the media that can reach a wide range of the target audience, and help ensure Iowa 511 distribution benefits users across significantly different geographic areas, incomes, ages, etc.

- The currently used Google Analytics provided several summaries of Iowa 511 web usage data, but limited flexibility in terms of the default queries, which restricted potential insights that could be gained from the data. The raw web logs could be used to develop improved analytical constructs. Other logs, such as the usage of roadway cameras and other specific tools, will be very helpful in future evaluations of the Iowa 511 Traveler Information System.

  This study demonstrated a need for better data gathering using improved web logging.

REFERENCES

Ben-Elia, E, R Di Pace, G. N. Bifulco, and Y Shiftan. 2013. The Impact of Travel Information's Accuracy on Route-Choice. *Transportation Research Part C: Emerging Technologies*. 26, pp. 146–159.

Deeter, Dean, Ginny Crowson, Tina Roelofs, Jeremy Schroeder, and Deepak Gopalakrishna. 2014. *Best Practices for Road Condition Reporting Systems: Synthesis Report*. FHWA-HOP-14-023. Federal Highway Administration, U.S. Department of Transportation.

Morris, Nichole, Alice Ton, Jennifer Cooper, Chris Edwards, and Max Donath. 2014. *A Next Generation Non-Distracting In-Vehicle 511 Traveler Information Service*. Center for Transportation Studies, University of Minnesota, St. Paul, MN.

Patten, C. J. D., A. Kircher, J. Östlund, and L. Nilsson. 2004. Using Mobile Telephones: Cognitive Workload and Attention Resource Sllocation. *Accident Analysis & Prevention*, Vol 36, Issue 3, pp.341-350.

Qiao, F., Q. Zhu, and L. Yu. 2011. Social Media Applications to Publish Dynamic Transportation Information on Campus. ICCTP 2011: Towards Sustainable Transportation Systems, pp. 4318–4329. 11th International Conference of Chinese Transportation Professionals (ICCTP), August 14-17, 2011, Nanjing, China.

Raine, J., A. Withill, and M. Morecock Eddy. 2014. *Literature Review of the Costs and Benefits of Traveller Information Projects*. NZ Transport Agency Research Report 548. Wellington, New Zealand.

Robinson, Emanuel, Thomas Jacobs, Kathleen Frankle, Nayel Serulle, and Michael Pack. 2012. *Deployment, Use, and Effect of Real-Time Traveler Information Systems*. NCHRP Web-Only Document 192. National Cooperative Highway Research Program (NCHRP).

APPENDIX A: ANALYSIS OF ONLINE SURVEY

An online survey was conducted from May 20 through June 15, 2015. The survey was delivered to current Iowa 511 users and Iowa DOT employees by email, and it was also posted on Iowa 511 social media webpages. The survey focused on usage of the Iowa 511 system by current users.

Users Statistics

Of the 362 respondents, about 78% (283/362) had used 511 services. Most of the respondents were Iowa DOT employees (82% or 296/362). As shown in Table A.1, more than 36% of the respondents were 51-60 years old and more than 25% were 41-50.

Table A.1 Online survey respondent age groups

Age Group	Frequency	Percent
18-25	13	3.59%
26-30	20	5.52%
31-40	56	15.47%
41-50	92	25.41%
51-60	131	36.19%
over 60	44	12.15%
No response	6	1.66%

Among the 61 non-Iowa DOT respondents, about 83% (51/61) had used an Iowa 511 service, and 44 had used more than one type of Iowa 511 service. The Iowa 511 websites and apps were the most used services, followed by Iowa 511 Twitter and Facebook. About 64% (32/51) of the non-Iowa DOT 511 users commuted between two cities on a typical weekday, and 51 % (26/51) reported commuting more than one hour per day.

The home address and commute destination address were in the same zip code area for all 10 non-Iowa DOT respondents not using 511 services, and eight of them (80%) reporting driving less than one hour on a typical weekday. Shorter commute distances and small traveling areas reduced the likelihood of using Iowa 511 services.

Traveler Information Sources

Most respondents for the online survey used Iowa 511 websites and apps as their primary traffic information sources. The websites and apps used by the respondents are shown in Tables A.2 and A.3.

Table A.2. Websites used by online survey respondents

Website	DOT	Non-DOT	Total	
	Frequency	Frequency	Frequency	Percent
None	60	5	65	17.96
Iowa 511 website	111	26	137	37.85
Google Maps	55	17	72	19.89
Mapquest	21	3	24	6.63
Waze	1	2	3	0.83
Local TV/ Radio websites	43	5	48	13.26
Facebook/ Twitter	3	3	6	1.66
Other	4	0	4	1.10
No response	3	0	3	0.83

Table A.3. Mobile apps used by online survey respondents

App	DOT	Non-DOT	Total	
	Frequency	Frequency	Frequency	Percent
None	133	14	133	36.74
Iowa 511 app	90	24	90	24.86
Google Maps app	80	12	80	22.10
Mapquest app	11	1	11	3.04
Waze app	11	3	11	3.04
Beat the traffic	3	0	3	0.83
Facebook/Twitter	9	2	9	2.49
Other	12	3	12	3.31
No response	13	2	13	3.59

For 38% of the respondents the Iowa 511 website (LB or HB) was the primary website for traffic information, and Google Maps was the second-most frequently used website. Local TV/radio websites were used by 13% of the respondents for traffic information.

Most of the respondents searched for traffic information occasionally, usually before a trip. More than 60% (218/362) of the respondents used weather-related information before their trips, about

44% (158/362) used congestion/road construction and traffic incidents information before their trips, and about 29% used travel time information before a trip.

About 37% of the respondents did not use any mobile apps for traffic information. Iowa 511 apps and Google Maps were the most frequently used by the mobile app users.

APPENDIX B: STATISTICAL MODELING FOR IOWA 511 USERS

Statistical analyses using the web logs and NWS COOP weather data were conducted to investigate factors that affect usage of Iowa 511. The statistical analyses included binomial probit modeling for user choice on travel information sources, and negative binomial modeling for estimating Iowa 511 website and phone usages.

Binomial Probit Models

Binomial probit models were developed to examine differences among those who use the Iowa 511 service versus alternatives (i.e., Google Maps, in-car navigation system, etc.). Several factors, such as age, commute distance, and MVD location, were examined to ascertain differences in use among various segments of the driving population.

Iowa 511

Table A.4 present the final best fit model for Iowa 511 with the MVD survey data.

Table A.4. Binomial probit model for predicting the probability of using Iowa 511 system

Dependent variable IOWA511
Log likelihood function -341.29311
Restricted log likelihood -351.26189
Chi squared [3 d.f.] 19.93755
Significance level .00017
McFadden Pseudo R-squared .0283799
Estimation based on N = 788, K = 4
Inf.Cr.AIC = 690.6 AIC/N = .876
Hosmer-Lemeshow chi-squared = 18.51222
P-value= .01770 with deg.fr. = 8

Variables		Coefficient	Prob. |z|>Z*	Marginal Effects
Constant		1.3657	0	-
AGE3160	Indicator of ages 31 to 60	0.39894***	0.0003	0.09475***
COMM1TO2	Indicator of commute distance within 2 miles	0.21969*	0.0961	0.05508
COMM2UP	Indicator of commute distance more than 2 miles	0.3069**	0.0181	0.07838**

***, **, * = at 99%, 95%, 90% levels of confidence, respectively

The analysis showed age and commute distance to be significant determinants of use (at a 95% confidence level). Survey respondents aged 31 to 60 and those with daily commute distances more than two miles were more likely to use Iowa 511 as the most used services for traveler information. The marginal effects for age and commute distance indicated that those aged 31 to 60 were 9.5% more likely to use the 511 service while those with daily commute distances more than two miles were 7.8% more likely to use 511.

Notably, no consistent trends were exhibited with respect to the cities where the surveys were conducted. This implies that the sample users from all the MVD sites were equally likely to use the 511 portal when controlling for age and commute distance.

In-Car Navigation Systems

A binomial probit model was developed to better understand the travel information seekers using in-car navigation systems as their major information source. The model results are shown in Table A.5.

Table A.5. Binomial probit model for predicting the probability of using in-car navigation system

Dependent variable CARNAV
Log likelihood function -417.01560
Restricted log likelihood -422.24516
Chi squared [3 d.f.] 10.45912
Significance level .01504
McFadden Pseudo R-squared .0123851
Estimation based on N = 770, K = 4
Inf.Cr.AIC = 842.0 AIC/N = 1.094
Hosmer-Lemeshow chi-squared = 2.38036
P-value = .96708 with deg.fr. = 8

Variables		Coefficient	Prob. |z|>Z*	Marginal Effects
Constant		0.90882***	0	-
AGE3140	Indicator of ages 31 to 40	0.30354**	0.0212	0.09845**
AGE4160	Indicator of ages 41 to 60	0.19454*	0.0862	0.06066*
COMM2UP	Indicator of commute distance more than 2 miles	0.21901**	0.0434	0.06919**

***, **, * = at 99%, 95%, and 90% levels of confidence, respectively

The probability of using an in-car navigation system was shown to be related to age group and commute distance. People between the ages of 31 and 40 were found to be 9% more likely to use in-car navigation systems, while those with daily commute distances greater than two miles were 7% more likely to use in-car navigation systems.

Google Maps

The binomial probit model results are shown in Table A.6.

Table A.6. Binomial probit model for predicting the probability of using Google Maps

Dependent variable GOOGLE
Log likelihood function -503.86925
Restricted log likelihood -536.28660
Chi squared [5 d.f.] 64.83470
Significance level .00000
McFadden Pseudo R-squared .0604478
Estimation based on N = 774, K = 6
Inf.Cr.AIC = 1019.7 AIC/N = 1.317
Hosmer-Lemeshow chi-squared = 5.26187
P-value= .72926 with deg.fr. = 8

Variables		Coefficient	Prob. |z|>Z*	Marginal Effects
Constant		-0.7183***	<0.0001	-
AGE1830	Indicator of ages 18 to 30	1.07047***	<0.0001	0.38254***
AGE3140	Indicator of ages 31 to 40	0.73661***	<0.0001	0.25461***
AGE4150	Indicator of ages 41 to 50	0.58554***	0.0005	0.20477***
AGE5160	Indicator of ages 51 to 60	0.40591**	0.0203	0.1445**
COMM1TO4	Indicator of commute distance from 1 to 4 miles	0.17876*	0.0557	0.06685*

***, **, * = at 99%, 95%, and 90% levels of confidence, respectively

Google Maps captures a larger market share for users 18 to 30 years of age. Respondents 18 to 30 were 38% more likely to use Google Maps. The marginal effects for the other age groups showed the use of Google Maps was 25% higher among ages 31 to 40, 20% higher among those 41 to 50, and 14% higher among those 51 to 60 with all rates compared to those for above age 60.

User Count Models

Negative binomial (NB) modeling was used to estimate the 511 website and phone usages. The dependent variables used in the models are listed in Table A.7.

Table A.7. Model variables for the negative binomial models

Variables		Variables	
PRECIPTO	Total precipitation	**MAY14**	Dummy variable for May 2014
SNOWTO	Total snow depth	**JUN14**	Dummy variable for June 2014
PRIORPRE	Precipitation of previous day	**JUL14**	Dummy variable for July 2014
PRIORSNO	Snow depth of previous day	**AUG14**	Dummy variable for Aug 2014
JUL13	Dummy variable for July 2013	**SEP14**	Dummy variable for Sep 2014
AUG13	Dummy variable for Aug 2013	**OCT14**	Dummy variable for Oct 2014
SEP 13	Dummy variable for Sep 2013	**NOV14**	Dummy variable for Nov 2014
OCT13	Dummy variable for Oct 2013	**DEC14**	Dummy variable for Dec 2014
NOV13	Dummy variable for Nov 2013	**JAN15**	Dummy variable for Jan 2015
DEC13	Dummy variable for Dec 2013	**FEB15**	Dummy variable for Feb 2015
JAN14	Dummy variable for Jan 2014	**MAR15**	Dummy variable for Mar 2015
FEB14	Dummy variable for Feb 2014	**APR15**	Dummy variable for Apr 2015
MAR14	Dummy variable for Mar 2014	**MAY15**	Dummy variable for May 2015
APR14	Dummy variable for Apr 2014	-	-

LB Web Users

The NB model estimates for LB site users are listed in Table A.8. The variables listed in this table are statistically significant at the 95% confidence level. The Dispersion parameter for the NB model is significantly different from zero, which indicates the NB model is appropriate for the data. LB users are positively related to the total and to prior snow depths and precipitations. The months of September and October 2013, August and October 2014, and April and May 2015 are negatively correlated to the LB users.

Table A.8. NB model estimates for LB users

Dependent variable:	LBUSERS	
Log likelihood function:	-5989.69476	
Restricted log likelihood:	-789522.27785	
Chi squared [1 d.f.]:	1567065.16618	
Significance level :	.00000	
McFadden Pseudo R-squared	.9924135	
Estimation based on N =	730, K = 29	
Inf.Cr.AIC = 12037.4 AIC/N =	16.490	
Variables	**Coefficient**	**Prob. |z|>Z***
Constant	6.78731	0
PRECIPTO	0.00705	0
SNOWTO	0.00827	0
PRIORPRE	0.00306	0.0114
SEP 13	-0.77453	0.0225
OCT13	-0.69134	0.0006
NOV13	0.5181	0.0027
DEC13	2.08625	0
JAN14	2.4515	0
FEB14	1.96226	0
MAR14	1.19892	0
AUG14	-0.65643	0.0261
OCT14	-0.74987	0.023
NOV14	1.31806	0
DEC14	1.08351	0
JAN15	1.83995	0
FEB15	1.35696	0
MAR15	0.88618	0
APR15	-0.52314	0.0465
MAY15	-0.57264	0.0147
Dispersion parameter	0.44606	0

HB Web Users

The NB model estimates for HB site users are listed in Table A.9. The variables listed in this table are statistically significant at the 95% confidence level. The Dispersion parameter for the NB model is significantly different from zero, which indicates the NB model is appropriate for the data. The HB users are positively related to the total snow depths and precipitations. The HB site users decreased in the months of September and October 2013, October 2014, and April and May 2015.

Table A.9. NB model estimate for HB users

Dependent variable: HBUSERS Log likelihood function; -6014.91612 Restricted log likelihood: -934787.40993 Chi squared [1 d.f.]: 1857544.98761 Significance level : .00000 McFadden Pseudo R-squared; .9935655 Estimation based on N = 730, K = 29 Inf.Cr.AIC = 12087.8 AIC/N = 16.559		
Variables	Coefficient	Prob. |z|>Z*
Constant	6.90752	0
PRECIPTO	0.00742	0.0001
SNOWTO	0.00978	0
SEP 13	-0.66533	0.0149
OCT13	-0.69982	0.0098
NOV13	0.43409	0.0444
DEC13	1.79932	0
JAN14	2.22997	0
FEB14	1.77794	0
MAR14	0.67934	0.0053
OCT14	-0.80522	0.0333
NOV14	1.12191	0
DEC14	0.67147	0.0065
JAN15	1.56237	0
FEB15	0.9259	0
MAR15	0.48529	0.0264
APR15	-0.7773	0.0162
MAY15	-0.61305	0.0306
Dispersion parameter	0.53360	0

Mobile Web Users

The NB model estimates for mobile site users are listed in Table A.10. The variables listed in this table are statistically significant at the 95% confidence level. The Dispersion parameter for the NB model is significantly different from zero, which indicates the NB model is appropriate for the data. The mobile site users are positively related to the total snow depths and precipitations, and negatively related with all the month indicators listed in Table A.10, even for the winter months. The months of August and October 2014 have the greatest marginal effects on the mobile uses, which can reduce the mobile site user by about two users per day.

Table A.10. NB model estimate for mobile web users

Dependent variable	MOBILE	
Log likelihood function	-4370.12056	
Restricted log likelihood	-57760.82598	
Chi squared [1 d.f.]	106781.41083	
Significance level	.00000	
McFadden Pseudo R-squared	.9243411	
Estimation based on N =	730, K = 29	
Inf.Cr.AIC =	8798.2 AIC/N =	12.052
Variables	Coefficient	Prob. |z|>Z*
Constant	6.01747	0
PRECIPTO	0.00535	0.0012
SNOWTO	0.00758	0
JUL13	-0.53094	0.0169
AUG13	-0.62492	0.0021
SEP 13	-0.99024	0
OCT13	-0.98583	0
MAR14	-1.12048	0
APR14	-1.46234	0
MAY14	-1.87842	0
JUN14	-1.40854	0
JUL14	-1.42863	0
AUG14	-2.03401	0
SEP14	-1.8201	0
OCT14	-2.00274	0
NOV14	-0.84707	0
DEC14	-1.3693	0
JAN15	-0.57877	0.0001
FEB15	-1.04537	0
MAR15	-1.18053	0
APR15	-1.86069	0
MAY15	-1.45194	0
Dispersion parameter	0.43101	0

App Users

The NB model estimates for the highway version of Iowa 511 App users are listed in Table A.11. The variables listed in this table are statistically significant at the 95% confidence level. The Dispersion parameter for the NB model is significantly different from zero, which indicates the NB model is appropriate for the data. The App users are positively related to the total and prior snow depths, as well as the total precipitations. The winter months from November 2014 to March 2015 can increase the App users by more than one user per day.

Table A.11. NB model estimate for App users

Dependent variable	APP	
Log likelihood function	-2798.47713	
Restricted log likelihood	-165140.76185	
Chi squared [1 d.f.]	324684.56945	
Significance level	.00000	
McFadden Pseudo R-squared	.9830540	
Estimation based on N =	365, K = 17	
Inf.Cr.AIC =	5631.0 AIC/N =	15.427
Variables	Coefficient	Prob. |z|>Z*
Constant	6.17711	0
PRECIPTO	0.00455	0.0242
SNOWTO	0.00596	0
PRIORSNO	0.00168	0.014
NOV14	1.41756	0
DEC14	1.36993	0
JAN15	1.95676	0
FEB15	1.58104	0
MAR15	1.27729	0
Dispersion parameter	0.31328	0

Phone Users

The NB model estimates for Iowa 511 phone users are listed in Table A.12. The variables listed in this table are statistically significant at the 95% confidence level. The Dispersion parameter for the NB model is significantly different from zero, which indicates the NB model is appropriate for the data. The phone users are positively related to the total snow depths and precipitations. The winter months from December 2013 to January 2014 are positively related to the phone users. The month of January 2014 can increase the phone users by more than one person per day.

Table A.12. NB model estimate for phone users

Dependent variable	TOTCALLS	
Log likelihood function	-4691.25914	
Restricted log likelihood	-61197.79611	
Chi squared [1 d.f.]	113013.07394	
Significance level	.00000	
McFadden Pseudo R-squared	.9233427	
Estimation based on N =	730, K = 29	
Inf.Cr.AIC =	9440.5 AIC/N =	12.932
Variables	Coefficient	Prob. |z|>Z*
Constant	5.82001	0
PRECIPTO	0.00754	0
SNOWTO	0.00659	0
SEP 13	-0.5418	0.0161
OCT13	-0.48	0.0153
NOV13	-0.2827	0.037
DEC13	0.65563	0
JAN14	1.03578	0
FEB14	0.56021	0.0001
APR14	-0.45334	0.0063
MAY14	-0.61795	0.0279
SEP14	-0.44484	0.0184
OCT14	-0.72815	0.0017
MAR15	-0.42435	0.0017
APR15	-0.75311	0.0035
MAY15	-0.57378	0.002
Dispersion parameter	.25351	0

APPENDIX C: MVD SURVEY RESPONSE FREQUENCY TABLES

City				
City	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
Ankeny	252	29.65	252	29.65
Carroll	41	4.82	293	34.47
Cedar Rapids	185	21.76	478	56.24
Council Bluffs	99	11.65	577	67.88
Dubuque	44	5.18	621	73.06
Fort Dodge	85	10.00	706	83.06
Mason City	68	8.00	774	91.06
Ottumwa	55	6.47	829	97.53
Spencer	21	2.47	850	100.00

Q1. Service used most often for Congestion/Road Construction & Closure information.				
Q1	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
None 0	434	51.06	434	51.06
In-car navigation 1	102	12.00	536	63.06
Google Maps 2	182	21.41	718	84.47
Iowa 511 phone 3	22	2.59	740	87.06
Iowa 511 online/app 4	36	4.24	776	91.30
Other 5	48	5.65	824	96.95
Missing 9	26	3.18	850	100.00

Q1 Oth. Other service used.				
Q1Oth	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
None, Not Applicable 0	802	94.35	802	94.35
Radio/Weather Radio 1	16	1.88	818	96.24
Phone app (other than 511) 2	7	0.82	825	97.06
TV/News (incl Weather Channel) 3	17	2.00	842	99.06
Family/friends 5	1	0.12	843	99.18
Other websites (Waze, Weather Bug, NOAA, Facebook, etc.) 6	4	0.47	847	99.65
Missing 9	3	0.35	850	100.00

Q2. When did you mostly use this service?				
Q2	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
Not Applicable 0	434	51.06	434	51.06
Before a trip 1	152	17.88	586	68.94
During a trip 2	179	21.06	765	90.00
During traffic congestion 3	51	6.00	816	96.00
Other 4	29	3.41	845	99.41
Missing 9	5	0.59	850	100.00

Q2 Oth. Other times service was used.				
Q2Oth	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No Other, Not Applicable 0	821	96.59	821	96.59
Seasonal/Bad weather/Winter 1	8	0.94	829	97.53
At work/Specific times of day (mornings) 2	6	0.71	835	98.24
Any time, all of the above 3	3	0.35	838	98.59
Every day 4	3	0.35	841	98.94
Missing 9	9	1.06	850	100.00

Q3. How often did you use this service in the past 6 months?				
Q3	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
Not Applicable 0	434	51.06	434	51.06
Almost every day 1	56	6.59	490	57.65
Once per week 2	61	7.18	551	64.82
Occasionally 3	285	33.53	836	98.35
Other 4	9	1.06	845	99.41
Missing 9	5	0.59	850	100.00

Q3 Oth. Other "how often" response.				
Q3Oth	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No Other, Not Applicable 0	841	98.94	841	98.94
Missing 9	9	1.06	850	100.00

Q4. Why do you use this service rather than other alternatives?				
Q4	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
Not Applicable 0	434	51.06	434	51.06
Easiest to use 1	299	35.18	733	86.24
It's accurate 2	76	8.94	809	95.18
Its unique features 3	17	2.00	826	97.18
Other 4	17	2.00	843	99.18
Missing 9	7	0.82	850	100.00

Q4 Oth. Other reasons for using this service.				
Q4Oth	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No Other, Not Applicable 0	833	98.00	833	98.00
Familiarity (I know how to use it) 1	3	0.35	836	98.35
Not aware of others 2	4	0.47	840	98.82
Missing 9	10	1.18	850	100.00

Q5. Service used most often for Weather-Related Travel information.				
Q5	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
None 0	341	40.12	341	40.12
In-car navigation 1	62	7.29	403	47.41
Google Maps 2	118	13.88	521	61.29
Iowa 511 phone 3	31	3.65	552	64.94
Iowa 511 online/app 4	88	10.35	640	75.29
Other 5	187	22.00	827	97.29
Missing 9	23	2.71	850	100.00

Q5 Oth. Other service used.				
Q5Oth	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No Other, Not Applicable 0	663	78.00	663	78.00
Radio/Weather Radio 1	22	2.59	685	80.59
Phone app (other than 511) 2	36	4.24	721	84.82
TV/News (incl Weather Channel) 3	95	11.18	816	96.00
Family/friends 5	1	0.12	817	96.12
Other websites (Waze, Weather Bug, NOAA, Facebook, etc.) 6	20	2.35	837	98.47
Newspaper and paper maps 7	1	0.12	838	98.59
Missing 9	12	1.41	850	100.00

Q6. When did you mostly use this service?				
Q6	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
Not Applicable 0	341	40.12	341	40.12
Before a trip 1	286	33.65	627	73.76
During a trip 2	126	14.82	753	88.59
During traffic congestion 3	36	4.24	789	92.82
Other 4	54	6.35	843	99.18
Missing 9	7	0.82	850	100.00

Q6 Oth. Other times service was used.				
Q6Oth	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No Other, Not Applicable 0	796	93.65	796	93.65
Seasonal/Bad weather/Winter 1	9	1.06	805	94.71
At work/Specific times of day (mornings) 2	9	1.06	814	95.76
Any time, all of the above 3	5	0.59	819	96.35
Every day 4	11	1.29	830	97.65
Missing 9	20	2.35	850	100.00

Q7. How often did you use this service in the past 6 months?				
Q7	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
Not Applicable 0	341	40.12	341	40.12
Almost every day 1	107	12.59	448	52.71
Most days in winter 2	113	13.29	561	66.00
During severe weather 3	248	29.18	809	95.18
Other 4	32	3.76	841	98.94
Missing 9	9	1.06	850	100.00

Q7 Oth. Other "how often" response.				
Q7Oth	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No Other, Not Applicable 0	818	96.24	818	96.24
Occasionally 1	7	0.82	825	97.06
Rarely, once a year 2	4	0.47	829	97.53
Missing 9	21	2.47	850	100.00

Q8. Why do you use this service rather than other alternatives?				
Q8	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
Not Applicable 0	341	40.12	341	40.12
Easiest to use 1	353	41.53	694	81.65
It's accurate 2	105	12.35	799	94.00
Its unique features 3	20	2.35	819	96.35
Other 4	24	2.82	843	99.18
Missing 9	7	0.82	850	100.00

Q8 Oth. Other reasons for using this service.				
Q8Oth	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No Other, Not Applicable 0	826	97.18	826	97.18
Familiarity (I know how to use it) 1	2	0.24	828	97.41
Not aware of others 2	5	0.59	833	98.00
Missing 9	17	2.00	850	100.00

Q9. Service used most often for Travel Time/Route information.				
Q9	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
None 0	262	30.82	262	30.82
In-car navigation 1	164	19.29	426	50.12
Google Maps 2	369	43.41	795	93.53
Iowa 511 phone 3	13	1.53	808	95.06
Iowa 511 online/app 4	10	1.18	818	96.24
Other 5	24	2.82	842	99.06
Missing 9	8	0.94	850	100.00

Q9 Oth. Other service used.				
Q9Oth	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No Other, Not Applicable 0	826	97.18	826	97.18
Radio/Weather Radio 1	1	0.12	827	97.29
Phone app (other than 511) 2	9	1.06	836	98.35
TV/News (incl Weather Channel) 3	5	0.59	841	98.94
Mapquest 4	4	0.47	845	99.41
Other websites (Waze, Weather Bug, NOAA, Facebook, etc.) 6	1	0.12	846	99.53
Newspaper and paper maps 7	2	0.24	848	99.76
Missing 9	2	0.24	850	100.00

Q10. When did you mostly use this service?				
Q10	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
Not Applicable 0	262	30.82	262	30.82
Before a trip 1	282	33.18	544	64.00
During a trip 2	258	30.35	802	94.35
During traffic congestion 3	26	3.06	828	97.41
Other 4	17	2.00	845	99.41
Missing 9	5	0.59	850	100.00

Q10 Oth. Other times service was used.				
Q10Oth	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No Other, Not Applicable 0	833	98.00	833	98.00
Seasonal/Bad weather/Winter 1	2	0.24	835	98.24
At work/Specific times of day (mornings) 2	1	0.12	836	98.35
Any time, all of the above 3	3	0.35	839	98.71
Every day 4	6	0.71	845	99.41
Missing 9	5	0.59	850	100.00

Q11. How often did you use this service in the past 6 months?				
Q11	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
Not Applicable 0	262	30.82	262	30.82
Almost every day 1	86	10.12	348	40.94
Once per week 2	129	15.18	477	56.12
Occasionally 3	353	41.53	830	97.65
Other 4	13	1.53	843	99.18
Missing 9	7	0.82	850	100.00

Q11 Oth. Other "how often" response.				
Q11Oth	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No Other, Not Applicable 0	837	98.47	837	98.47
Missing 9	13	1.53	850	100.00

Q12. Why do you use this service rather than other alternatives?				
Q12	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
Not Applicable 0	262	30.82	262	30.82
Easiest to use 1	451	53.06	713	83.88
It's accurate 2	87	10.24	800	94.12
Its unique features 3	27	3.18	827	97.29
Other 4	15	1.76	842	99.06
Missing 9	8	0.94	850	100.00

Q12 Oth. Other reasons for using this service.				
Q12Oth	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No Other, Not Applicable 0	835	98.24	835	98.24
Familiarity (I know how to use it) 1	4	0.47	839	98.71
Not aware of others 2	3	0.35	842	99.06
It's what's available in my work vehicle 3	1	0.12	843	99.18
Missing 9	7	0.82	850	100.00

Q13. During the past 6 months, how many hours did you drive on a typical work day (or week day)?				
Q13	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
Less than 1 hour 1	357	42.00	357	42.00
One to two hours 2	223	26.24	580	68.24
Two to four hours 3	123	14.47	703	82.71
Four hours/day or more 4	102	12.00	805	94.71
Missing 9	45	5.29	850	100.00

Q14. Zip Code of your home address				
Q14	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
3841	1	0.12	1	0.12
19082	1	0.12	2	0.24
30083	1	0.12	3	0.35
35051	1	0.12	4	0.47
46385	1	0.12	5	0.59
50009	11	1.29	16	1.88
50010	1	0.12	17	2.00
50021	15	1.76	32	3.76
50023	18	2.12	50	5.88
50026	1	0.12	51	6.00
50035	3	0.35	54	6.35
50061	1	0.12	55	6.47
50076	2	0.24	57	6.71
50111	6	0.71	63	7.41
50112	1	0.12	64	7.53
50126	1	0.12	65	7.65
50129	1	0.12	66	7.76
50131	8	0.94	74	8.71
50135	1	0.12	75	8.82

Q14. Zip Code of your home address				
Q14	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
50161	1	0.12	76	8.94
50169	4	0.47	80	9.41
50201	1	0.12	81	9.53
50211	1	0.12	82	9.65
50219	1	0.12	83	9.76
50223	1	0.12	84	9.88
50226	5	0.59	89	10.47
50247	1	0.12	90	10.59
50249	1	0.12	91	10.71
50261	1	0.12	92	10.82
50263	3	0.35	95	11.18
50265	9	1.06	104	12.24
50266	15	1.76	119	14.00
50276	1	0.12	120	14.12
50305	1	0.12	121	14.24
50309	8	0.94	129	15.18
50310	14	1.65	143	16.82
50311	2	0.24	145	17.06
50312	1	0.12	146	17.18
50313	8	0.94	154	18.12
50314	5	0.59	159	18.71
50315	14	1.65	173	20.35
50316	11	1.29	184	21.65
50317	19	2.24	203	23.88
50319	1	0.12	204	24.00
50320	9	1.06	213	25.06
50321	4	0.47	217	25.53
50322	20	2.35	237	27.88
50324	2	0.24	239	28.12

Q14. Zip Code of your home address				
Q14	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
50325	1	0.12	240	28.24
50327	4	0.47	244	28.71
50401	41	4.82	285	33.53
50420	1	0.12	286	33.65
50428	8	0.94	294	34.59
50436	1	0.12	295	34.71
50441	1	0.12	296	34.82
50452	1	0.12	297	34.94
50456	2	0.24	299	35.18
50468	1	0.12	300	35.29
50469	3	0.35	303	35.65
50475	1	0.12	304	35.76
50479	1	0.12	305	35.88
50501	47	5.53	352	41.41
50518	2	0.24	354	41.65
50523	3	0.35	357	42.00
50524	1	0.12	358	42.12
50525	2	0.24	360	42.35
50532	2	0.24	362	42.59
50536	1	0.12	363	42.71
50543	4	0.47	367	43.18
50544	2	0.24	369	43.41
50548	1	0.12	370	43.53
50551	1	0.12	371	43.65
50557	1	0.12	372	43.76
50558	1	0.12	373	43.88
50563	1	0.12	374	44.00
50569	2	0.24	376	44.24
50579	2	0.24	378	44.47

Q14. Zip Code of your home address				
Q14	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
50585	1	0.12	379	44.59
50595	3	0.35	382	44.94
50599	1	0.12	383	45.06
50601	2	0.24	385	45.29
50648	1	0.12	386	45.41
50658	2	0.24	388	45.65
50702	1	0.12	389	45.76
50801	1	0.12	390	45.88
51023	1	0.12	391	46.00
51031	1	0.12	392	46.12
51033	1	0.12	393	46.24
51201	1	0.12	394	46.35
51232	1	0.12	395	46.47
51301	13	1.53	408	48.00
51334	2	0.24	410	48.24
51338	1	0.12	411	48.35
51366	1	0.12	412	48.47
51401	18	2.12	430	50.59
51433	1	0.12	431	50.71
51443	4	0.47	435	51.18
51445	1	0.12	436	51.29
51449	2	0.24	438	51.53
51454	2	0.24	440	51.76
51455	3	0.35	443	52.12
51458	1	0.12	444	52.24
51465	2	0.24	446	52.47
51501	33	3.88	479	56.35
51503	34	4.00	513	60.35
51521	2	0.24	515	60.59

Q14. Zip Code of your home address				
Q14	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
51525	2	0.24	517	60.82
51526	3	0.35	520	61.18
51540	1	0.12	521	61.29
51542	1	0.12	522	61.41
51549	1	0.12	523	61.53
51555	1	0.12	524	61.65
51560	3	0.35	527	62.00
51565	1	0.12	528	62.12
51571	1	0.12	529	62.24
51575	1	0.12	530	62.35
51576	4	0.47	534	62.82
51577	1	0.12	535	62.94
52001	11	1.29	546	64.24
52002	1	0.12	547	64.35
52003	4	0.47	551	64.82
52008	1	0.12	552	64.94
52040	4	0.47	556	65.41
52045	2	0.24	558	65.65
52046	1	0.12	559	65.76
52101	1	0.12	560	65.88
52172	1	0.12	561	66.00
52202	1	0.12	562	66.12
52203	2	0.24	564	66.35
52205	1	0.12	565	66.47
52213	1	0.12	566	66.59
52214	1	0.12	567	66.71
52233	5	0.59	572	67.29
52234	1	0.12	573	67.41
52240	1	0.12	574	67.53

Q14. Zip Code of your home address				
Q14	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
52241	1	0.12	575	67.65
52242	1	0.12	576	67.76
52253	2	0.24	578	68.00
52302	17	2.00	595	70.00
52306	1	0.12	596	70.12
52314	1	0.12	597	70.24
52317	2	0.24	599	70.47
52318	1	0.12	600	70.59
52323	1	0.12	601	70.71
52324	1	0.12	602	70.82
52328	1	0.12	603	70.94
52332	1	0.12	604	71.06
52336	2	0.24	606	71.29
52338	1	0.12	607	71.41
52351	1	0.12	608	71.53
52353	1	0.12	609	71.65
52362	1	0.12	610	71.76
52401	1	0.12	611	71.88
52402	37	4.35	648	76.24
52403	25	2.94	673	79.18
52404	37	4.35	710	83.53
52405	25	2.94	735	86.47
52406	1	0.12	736	86.59
52411	1	0.12	737	86.71
52501	32	3.76	769	90.47
52531	1	0.12	770	90.59
52537	2	0.24	772	90.82
52544	2	0.24	774	91.06
52552	1	0.12	775	91.18

Q14. Zip Code of your home address				
Q14	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
52554	1	0.12	776	91.29
52556	1	0.12	777	91.41
52560	2	0.24	779	91.65
52567	1	0.12	780	91.76
52576	1	0.12	781	91.88
52577	2	0.24	783	92.12
52585	1	0.12	784	92.24
52588	1	0.12	785	92.35
52591	1	0.12	786	92.47
52601	1	0.12	787	92.59
52641	1	0.12	788	92.71
52730	1	0.12	789	92.82
52804	1	0.12	790	92.94
53001	1	0.12	791	93.06
63440	1	0.12	792	93.18
63561	1	0.12	793	93.29
68111	1	0.12	794	93.41
68114	1	0.12	795	93.53
68123	1	0.12	796	93.65
68134	1	0.12	797	93.76
68137	1	0.12	798	93.88
68850	1	0.12	799	94.00
90814	1	0.12	800	94.12
99999	50	5.88	850	100.00

Q15. Zip Code of the place you travel to most often on weekdays.				
Q15	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
3865	1	0.12	1	0.12
11111	12	1.41	13	1.53
19151	1	0.12	14	1.65
22222	6	0.71	20	2.35
35051	1	0.12	21	2.47
50002	1	0.12	22	2.59
50007	1	0.12	23	2.71
50009	8	0.94	31	3.65
50010	1	0.12	32	3.76
50011	1	0.12	33	3.88
50014	1	0.12	34	4.00
50021	8	0.94	42	4.94
50023	10	1.18	52	6.12
50031	1	0.12	53	6.24
50036	1	0.12	54	6.35
50111	6	0.71	60	7.06
50112	1	0.12	61	7.18
50125	1	0.12	62	7.29
50129	1	0.12	63	7.41
50131	3	0.35	66	7.76
50161	1	0.12	67	7.88
50169	1	0.12	68	8.00
50201	1	0.12	69	8.12
50219	2	0.24	71	8.35
50226	3	0.35	74	8.71
50233	1	0.12	75	8.82
50237	1	0.12	76	8.94
50263	1	0.12	77	9.06
50265	9	1.06	86	10.12

Q15. Zip Code of the place you travel to most often on weekdays.				
Q15	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
50266	12	1.41	98	11.53
50305	1	0.12	99	11.65
50309	19	2.24	118	13.88
50310	12	1.41	130	15.29
50311	3	0.35	133	15.65
50312	3	0.35	136	16.00
50313	4	0.47	140	16.47
50314	4	0.47	144	16.94
50315	9	1.06	153	18.00
50316	8	0.94	161	18.94
50317	13	1.53	174	20.47
50318	1	0.12	175	20.59
50319	3	0.35	178	20.94
50320	8	0.94	186	21.88
50321	1	0.12	187	22.00
50322	15	1.76	202	23.76
50324	2	0.24	204	24.00
50325	2	0.24	206	24.24
50326	1	0.12	207	24.35
50327	1	0.12	208	24.47
50329	1	0.12	209	24.59
50392	1	0.12	210	24.71
50401	46	5.41	256	30.12
50420	1	0.12	257	30.24
50428	5	0.59	262	30.82
50456	1	0.12	263	30.94
50458	1	0.12	264	31.06
50469	1	0.12	265	31.18
50475	1	0.12	266	31.29

Q15. Zip Code of the place you travel to most often on weekdays.				
Q15	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
50482	1	0.12	267	31.41
50501	56	6.59	323	38.00
50511	1	0.12	324	38.12
50518	2	0.24	326	38.35
50525	2	0.24	328	38.59
50530	2	0.24	330	38.82
50533	1	0.12	331	38.94
50536	1	0.12	332	39.06
50543	1	0.12	333	39.18
50548	1	0.12	334	39.29
50551	1	0.12	335	39.41
50568	1	0.12	336	39.53
50595	5	0.59	341	40.12
50601	1	0.12	342	40.24
50613	1	0.12	343	40.35
50625	1	0.12	344	40.47
50701	2	0.24	346	40.71
50702	2	0.24	348	40.94
50801	1	0.12	349	41.06
51031	1	0.12	350	41.18
51033	1	0.12	351	41.29
51201	1	0.12	352	41.41
51301	14	1.65	366	43.06
51351	2	0.24	368	43.29
51401	16	1.88	384	45.18
51442	2	0.24	386	45.41
51443	2	0.24	388	45.65
51449	1	0.12	389	45.76
51450	1	0.12	390	45.88

Q15. Zip Code of the place you travel to most often on weekdays.				
Q15	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
51454	1	0.12	391	46.00
51455	2	0.24	393	46.24
51465	1	0.12	394	46.35
51501	32	3.76	426	50.12
51503	16	1.88	442	52.00
51537	1	0.12	443	52.12
51542	1	0.12	444	52.24
51549	1	0.12	445	52.35
51555	1	0.12	446	52.47
51560	2	0.24	448	52.71
51577	1	0.12	449	52.82
52001	9	1.06	458	53.88
52003	6	0.71	464	54.59
52004	1	0.12	465	54.71
52008	1	0.12	466	54.82
52040	1	0.12	467	54.94
52042	1	0.12	468	55.06
52045	2	0.24	470	55.29
52046	2	0.24	472	55.53
52101	1	0.12	473	55.65
52172	1	0.12	474	55.76
52203	2	0.24	476	56.00
52206	1	0.12	477	56.12
52213	1	0.12	478	56.24
52233	1	0.12	479	56.35
52240	1	0.12	480	56.47
52241	3	0.35	483	56.82
52242	4	0.47	487	57.29
52302	9	1.06	496	58.35

Q15. Zip Code of the place you travel to most often on weekdays.				
Q15	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
52305	1	0.12	497	58.47
52314	5	0.59	502	59.06
52317	1	0.12	503	59.18
52328	1	0.12	504	59.29
52333	2	0.24	506	59.53
52339	1	0.12	507	59.65
52349	1	0.12	508	59.76
52353	1	0.12	509	59.88
52401	9	1.06	518	60.94
52402	28	3.29	546	64.24
52403	14	1.65	560	65.88
52404	42	4.94	602	70.82
52405	9	1.06	611	71.88
52407	1	0.12	612	72.00
52411	3	0.35	615	72.35
52498	2	0.24	617	72.59
52501	36	4.24	653	76.82
52537	1	0.12	654	76.94
52544	3	0.35	657	77.29
52554	1	0.12	658	77.41
52556	1	0.12	659	77.53
52576	1	0.12	660	77.65
52577	1	0.12	661	77.76
52588	1	0.12	662	77.88
52591	1	0.12	663	78.00
52641	1	0.12	664	78.12
52732	1	0.12	665	78.24
52772	1	0.12	666	78.35
52806	1	0.12	667	78.47

Q15. Zip Code of the place you travel to most often on weekdays.				
Q15	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
57104	1	0.12	668	78.59
60619	1	0.12	669	78.71
62450	1	0.12	670	78.82
63440	1	0.12	671	78.94
66102	1	0.12	672	79.06
68102	2	0.24	674	79.29
68108	1	0.12	675	79.41
68110	2	0.24	677	79.65
68111	1	0.12	678	79.76
68112	1	0.12	679	79.88
68114	1	0.12	680	80.00
68127	3	0.35	683	80.35
68128	1	0.12	684	80.47
68131	5	0.59	689	81.06
68134	1	0.12	690	81.18
68136	1	0.12	691	81.29
68137	1	0.12	692	81.41
68144	1	0.12	693	81.53
68154	3	0.35	696	81.88
68847	1	0.12	697	82.00
77662	1	0.12	698	82.12
78629	1	0.12	699	82.24
90245	1	0.12	700	82.35
90814	1	0.12	701	82.47
99999	149	17.53	850	100.00

Q16. Your age category				
Q16	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
18-25 years 1	184	21.65	184	21.65
26-30 years 2	87	10.24	271	31.88
31-40 years 3	154	18.12	425	50.00
41-50 years 4	153	18.00	578	68.00
51-60 years 5	127	14.94	705	82.94
Over 60 years 6	125	14.71	830	97.65
Missing 9	20	2.35	850	100.00

Q17. Are you an employee of the Iowa Department of Transportation?				
Q17	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No 0	796	93.65	796	93.65
Yes 1	32	3.76	828	97.41
Missing 9	22	2.59	850	100.00

Q18. Have you ever used Iowa 511 services?				
Q18	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No 0	598	70.35	598	70.35
Yes 1	204	24.00	802	94.35
Missing 9	48	5.65	850	100.00

Q19_1. Have you used 511 phone?				
Q19_1	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No 0	718	84.47	718	84.47
Yes 1	76	8.94	794	93.41
Missing 9	56	6.59	850	100.00

Q19_2. Have you used 511 website?				
Q19_2	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No 0	689	81.06	689	81.06
Yes 1	105	12.35	794	93.41
Missing 9	56	6.59	850	100.00

Q19_3. Have you used 511 mobile app?				
Q19_3	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No 0	735	86.47	735	86.47
Yes 1	59	6.94	794	93.41
Missing 9	56	6.59	850	100.00

Q19_4. Have you used 511 Twitter/Facebook?				
Q19_4	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No 0	774	91.06	774	91.06
Yes 1	20	2.35	794	93.41
Missing 9	56	6.59	850	100.00

Q20_1. Do you use Traffic speeds on highways (real time)?				
Q20_1	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No 0	761	89.53	761	89.53
Yes 1	35	4.12	796	93.65
Missing 9	54	6.35	850	100.00

Q20_2. Do you use Road reports (road conditions, closures, or warnings due to weather or construction)?				
Q20_2	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No 0	632	74.35	632	74.35
Yes 1	164	19.29	796	93.65
Missing 9	54	6.35	850	100.00

Q20_3. Do you use Travel times / Routes?				
Q20_3	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No 0	765	90.00	765	90.00
Yes 1	31	3.65	796	93.65
Missing 9	54	6.35	850	100.00

Q20_4. Do you use Camera images of roads (real time)?				
Q20_4	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No 0	764	89.88	764	89.88
Yes 1	32	3.76	796	93.65
Missing 9	54	6.35	850	100.00

Q20_5. Do you use Electronic sign locations and messages?				
Q20_5	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No 0	782	92.00	782	92.00
Yes 1	14	1.65	796	93.65
Missing 9	54	6.35	850	100.00

Q20_6. Do you use Other information from Iowa 511?				
Q20_6	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No 0	794	93.41	794	93.41
Yes 1	2	0.24	796	93.65
Missing 9	54	6.35	850	100.00

Q20Oth. Other information used?				
Q20Oth	**Frequency**	**Percent**	**Cumulative Frequency**	**Cumulative Percent**
No Other, Not Applicable 0	848	99.76	848	99.76
Snowplow locations 1	1	0.12	849	99.88
Missing 9	1	0.12	850	100.00

APPENDIX D: FEEDBACK FROM MVD SURVEY RESPONDENTS

Q21. What new features or services would you like the Iowa DOT to add to its 511 Traveler Information System?
Q22. Do you have any ideas or comments on how we can improve the Iowa 511Traveler Information System?

Case ID	Q21 Features/Services	Q22 Ideas/Comments
1005	I'm not sure what services are already being provided	
1006		Get the word out about it to public. I didn't even know about it until this survey.
1014	Recent construction action going on which indicates what roads are closed	
1019	None. We waste too many tax dollars on things that require nothing more than common sense.	Yes! Get rid of it, and stop wasting tax money on crap that benefits the lazy!
1023	I never heard of Iowa 511	Tell people about it.
1034	Something simple for people who don't use computers.	Make it so the system can be used by anyone who has no computer skills.
1039	I'm not sure what it even is.	
1043	Phone application to check all road related issues whether is weather or construction.	Do a phone application.
1047	I didn't know there was a DOT 511 system.	
1048	I did not know about this service.	
2001	Honestly don't know much about it. Usually just fly by the seat of my pants most days.	Advertise on social media to spread the word more. Young people don't watch the news so that would be the best way to reach out to them.
2021		The digital road signs frequently have offensive "safety" notices. For example "Don't text and drive bobble head." This represents Iowa to people out of state. Should we be a state who calls people names for the sake of safety? Someone needs to be held responsible for those statements.
2031	It's not a service I use, because I don't travel often, but it sounds like a good service.	None that I can think of.
2032	Indicate whether interstate exits are on right or left of roadway - so you can prepare for proper lane upon exiting.	
2046	Apps for phone.	
2048	Call back option.	Call back option.

Case ID	Q21 Features/Services	Q22 Ideas/Comments
2058	Make it more known	Maybe easier to use.
2066	I have never heard of this service.	More information to make drivers aware of the service.
2070		I'd never heard of it, more awareness.
2071	Detours; other than that it looks good.	
2075	Outreach, more ads so I even know how to access it.	
2086	Weather radar. Quicker updating. Aerial maps of cities.	Make the app less congestive, use GPS locate to identify your current position.
2090	I really didn't know about the service. I will try it and see if it works for me.	
2097	Advise me when there's an accident	Different languages.
2102	Maybe more advertising. Never heard of it?	
2105	User friendly app for directions.	
2113	Not sure of current services.	
2115		Believe we use it on second hand basis through TV8. Would like more info on this service.
2125	Not sure, I like the system as is.	Not at this time.
2129	Unsure since I've never used the service before. I will start to check out the 511 system.	
2135	I don't know because I have never used the program.	
2136	Is there an app? If not, that be nice. A Facebook feed.	I've never used it or knew it existed.
2141	Rest stops.	
2145	I'm sorry I have never used 511. I have seen the signs on the road. Make an app for it - connect it to google maps. Everyone is always on their phones, maybe others would try it if there was an app for it.	
2146		More awareness.
2149	Never used it, so I can't say.	
2150	I was not aware of this service until today. I will try it out.	
2152	Not sure. I have never used before. I do not know if I would use in the future.	
2157	Alternative routes	

Case ID	Q21 Features/Services	Q22 Ideas/Comments
2162	Well in regards to me since I have never used the system myself I believe we should use an in phone free app. That is for the app and play store make it user friendly and advertise more.	
2169	A phone app.	
2178	I think it's fine.	
2186	Not sure. I plan on using the service though in the future.	
2189		I have not known about these services. I do intend on using them now.
2190		Iowa 511 doing a great job.
2230		Make it more widely advertised
3003	Never used it.	Never used it.
3005	I did not really this was available. Now that I am aware, will certainly access this. Thanks.	
3009	Quick reference guide how to link	More awareness of usage.
3010	Unknown - never heard of 511 till today.	
3011	I'm not sure never heard 511 before	No, sorry.
3020		Think it is confusing. Used during winter/bad driving conditions.
3023		Road conditions. Weather. Roads w/construction. Time for planned routes.
3035	I wasn't aware of this service and I'm unaware of its uses.	Show it (advertise) on the highway alert system . . . The one that has the amber alerts and road closure ahead info.
3050	Haven't used it so can't say what to add.	
3051	On road signs giving information.	
3053		Advertise - never even heard of it!
3057		Don't have any input. Never heard of or used 511.
3070	Just never tried.	
3074		Not sure what 511 is never used.
3077	Predict delay time for certain streets based on amount of cars already stopped or slowed down and based on car amount (traffic) averages.	
3078	Unsure, I've never seen or used it.	Make it more known. I didn't know about it before today.
3083	Not familiar enough to comment.	Not familiar enough to comment.

Case ID	Q21 Features/Services	Q22 Ideas/Comments
3084	Safety alerts at peak time of drunk driving.	Let more people know about it, because I have never heard of it.
3097	I don't have anything in particular to ad. I haven't a clue what services are offered with 511.	
3098	Not sure never used. I will have to look into the services.	
3101	Not sure what you have to offer if I've never used it. Would need to use to give my opinion.	
3103	I'm new to Iowa. I don't know what the 511 system is.	
3107	Better advertisement for it. I had never heard of it.	
3116	Not sure.	Don't know it.
3126		Never heard of service
3127	Never used - Didn't know it existed	Maybe let people know more about the service and its availability.
3128	I don't know what it is.	Get more publicity.
3134	More awareness.	None.
3147	Not sure, as I have never had an experience using "511". I will definitely be checking it out though for future use.	
3148	Don't know what it has.	
3154		I don't even know what it is. Make more people aware.
3161	Never heard of it.	
3162		Make knowledge of its existence more available.
3166	Not sure.	Apps, personalization of routes, maps online, and phone alerts.
3170	Better communication about the services as I have never heard of it.	
3173	Advertise, didn't know about it.	Advertise.
3177		More exposure not familiar with service. Not a big fan of social media!
3180	I didn't even know 511 existed. I keep my head in the sand more than I should.	
3182	Tie your system into common map application i.e., google waze garin etc.	Text alerts

Case ID	Q21 Features/Services	Q22 Ideas/Comments
3183		I didn't know it was there, always used phone apps, they were already on phone and easy to access.
6005	Haven't looked at it.	Haven't looked at it.
6023	More interactive app with easier usage. More stability.	
6030		Get more information to the public.
7015	Was not aware of apps. I will investigate these since I have blue tooth in car and will try 511 apps for car/phone.	I use 511. Because it is reliable/dependable.
7030	An app. Easier to use.	
7039	I have not used 511 because I did not know this service was available. Thank you for informing me of this service.	
7042		Letting people know it is there and what it is. I have never heard of the service.
7048	Advanced notice for weather/road conditions. More brief description of how the roads truly are and a percentage chance of making it through the roads.	
7057		Don't use much, but impressed with what's used.
8005		Access on all phones. Not so many construction zones!
8006	Am glad the way it is.	
8007	Not sure. As long as it has construction, travel time, and weather that would be good.	
8012	Other states that have road conditions to the 511	Multi state maps
5004		I was in awe the 511 had all those resources listed in the questions. So maybe market your available service to the public more.
5005		Put in the roads we travel in winter - you text us alerts when icy or closed.
5008	I didn't even know about it. Is there an app?	
5011	Emergency services	No. Throughout the state of Iowa our services are better than most. (More emergency situations resolutions; lone female traveler)
5013	I do not know what services they provide. I have never used 511 system before.	Not at this time.
5014	Haven't studied enough to know.	Didn't know about 511.
5034	Never heard of Iowa 511 before.	

Case ID	Q21 Features/Services	Q22 Ideas/Comments
5036		I was not aware of Iowa 511.
5056		Televise it.
5061		I wasn't even aware of it. Advertise!
5076		I did not know about it.
5087	I really don't know. I need to start using the Iowa 511 service since I just moved here.	I'll use the service. I haven't used it since I just moved here.
5088		Make it convenient
5097	Can't think of any . . . It is pretty useful as it is.	
9002		Think it is good even though I have never had to use it.
9004	Maps. Color graphs on conditions.	
9013		Make an app to use on a phone
9016	Possibly maybe to be known more, cause I've never heard of it.	
9033		Find a way to spread this information to people so they know about this service.
9041	Tell when, or how often and far away rest stops are.	
9049		Have problems with phone app on Android - when it works it's a great service.
9054	Not sure I've never looked at it.	Advertise that you can go online to use it. Is there an app?
9062		Get more information out about service. An app for phone would help (like Google Maps)
9067	Where the cops are! That would be helpful with speed traps.	
9068	Never heard of it.	Maybe get the word out to younger people that don't know about 511.
9082	I don't really know what it is.	More advertisements so people like me know what it is.

APPENDIX E: ONLINE SURVEY RESPONSE FREQUENCY TABLES

Q1. In the past 6 months, how often did you use the following services to get CONGESTION, ROAD CONSTRUCTION & CLOSURE or other traffic incident information?												
Information Source	More than 3 times per week		2-3 times per week		Once per week		Occasionally		Never		No Response	
	Frequency	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*
511 phone service	5	1.38	4	1.10	3	0.83	55	15.19	228	62.98	67	18.51
511 web/app	25	6.91	27	7.46	35	9.67	140	38.67	73	20.17	62	17.13
Websites other than 511	14	3.87	12	3.31	16	4.42	76	20.99	169	46.69	75	20.72
Mobile apps other than 511	9	2.49	9	2.49	13	3.59	68	18.78	187	51.66	76	20.99
In-vehicle navigation	13	3.59	12	3.31	19	5.25	65	17.96	183	50.55	70	19.34
Radio	42	11.60	26	7.18	23	6.35	103	28.45	100	27.62	68	18.78
TV	40	11.05	24	6.63	16	4.42	95	26.24	121	33.43	66	18.23
Electronic signs on highways	32	8.84	24	6.63	52	14.36	146	40.33	49	13.54	59	16.30
Something else	6	1.66	4	1.10	15	4.14	51	14.09	181	50.00	105	29.01

Q2, 5, 8. When did you most often use the service(s)?						
	Congestion, Road Construction, Traffic Incidents Information		Weather Related Travel Information		Travel Time Information	
Time of Use	*Frequency*	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*
Before a trip	158	43.65	218	60.22	105	29.01
During a trip	73	20.17	45	12.43	83	22.93
During traffic congestion	28	7.73	7	1.93	16	4.42
All of the above	9	2.49	10	2.76	3	0.83
Other	23	6.35	38	10.50	12	3.31
No Response	71	19.61	44	12.15	143	39.50

Q3, 6, 9. Why did you use the service(s)?						
	Congestion, Road Construction, Traffic Incidents Information		Weather Related Travel Information		Travel Time Information	
Reason for Use	*Frequency*	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*
Easiest to use	161	44.48	181	50.00	138	38.12
Accuracy	49	13.54	68	18.78	44	12.15
Unique features	15	4.14	17	4.70	5	1.38
My friends use it	3	0.83	3	0.83	2	0.55
Not aware of other services	33	9.12	29	8.01	19	5.25
Other	27	7.46	17	4.70	10	2.76
No Response	74	20.44	47	12.98	144	39.78

Q4. In the past 6 months, how often did you use the following services to get WEATHER-RELATED TRAVEL information?												
Information Source	Almost Every Day		Most Days in Winter		Occasionally		Never		Other		No Response	
	Frequency	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*	*Frequency*	*Percent*
511 phone service	7	1.93	11	3.04	39	10.77	212	58.56	22	6.08	71	19.61
511 web/app	23	6.35	76	20.99	109	30.11	83	22.93	14	3.87	57	15.75
Websites other than 511	27	7.46	61	16.85	88	24.31	104	28.73	20	5.52	62	17.13
Mobile apps other than 511	33	9.12	39	10.77	60	16.57	135	37.29	29	8.01	66	18.23
In-vehicle navigation	4	1.10	13	3.59	45	12.43	188	51.93	38	10.50	74	20.44
Radio	69	19.06	71	19.61	101	27.90	54	14.92	9	2.49	58	16.02
TV	90	24.86	75	20.72	93	25.69	44	12.15	12	3.31	48	13.26
Electronic signs on highways	23	6.35	36	9.94	143	39.50	81	22.38	14	3.87	65	17.96
Something else	10	2.76	12	3.31	35	9.67	157	43.37	46	12.71	102	28.18

Q7. In the past 6 months, how often did you use the following services to get TRAVEL TIME information?														
Information Source	More than 3 times per week		2-3 times per week		Once per week		Occasionally		Never		Other		No Response	
	Frequency	*%*	*Frequency*	*%*	*Frequency*	*%*	*Frequency*	*%*	*Frequency*	*%*	*Frequency*	*%*	*Frequency*	*%*
511 phone service	1	0.28	1	0.28	1	0.28	9	2.49	229	63.26	14	3.87	107	29.56
511 web/app	6	1.66	5	1.38	5	1.38	29	8.01	195	53.87	12	3.31	110	30.39
Websites other than 511	4	1.10	10	2.76	20	5.52	63	17.40	145	40.06	11	3.04	109	30.11
Mobile apps other than 511	5	1.38	10	2.76	17	4.70	50	13.81	159	43.92	13	3.59	108	29.83
In-vehicle navigation	6	1.66	10	2.76	14	3.87	46	12.71	159	43.92	15	4.14	112	30.94
Radio	16	4.42	10	2.76	3	0.83	56	15.47	153	42.27	12	3.31	112	30.94
TV	13	3.59	7	1.93	4	1.10	44	12.15	166	45.86	15	4.14	113	31.22
Electronic signs on highways	10	2.76	15	4.14	12	3.31	92	25.41	120	33.15	10	2.76	103	28.45
Something else	5	1.38	1	0.28	5	1.38	27	7.46	173	47.79	19	5.25	132	36.46

Q10. What is the main WEBSITE you use to get traffic information?		
Websites	***Frequency***	***Percent***
None	65	17.96
Iowa 511 website	137	37.85
Google Maps	72	19.89
Mapquest	24	6.63
Waze	3	0.83
Local TV/Radio websites	48	13.26
Social media (Facebook, Twitter, etc)	6	1.66
Other	4	1.10
No Response	3	0.83

Q11. What is the main MOBILE APP you use for traffic information?		
Mobile Apps	***Frequency***	***Percent***
None	133	36.74
Iowa 511 app	90	24.86
Google Maps app	80	22.10
Mapquest app	11	3.04
Waze app	11	3.04
Beat the traffic	3	0.83
Social media (Facebook, Twitter, etc) app	9	2.49
Other	12	3.31
No Response	13	3.59

Q12. What types of Iowa 511 services that you have EVER used?		
Services Used	***Frequency***	***Percent***
511 phone service	6	1.66
511 website	76	20.99
511 mobile app	10	2.76
511 Twitter/Facebook	2	0.55
511 Personalized email/text alert	3	0.83
More than 1 service	186	51.38
No Response	79	21.82

Q13. What information do you use from Iowa 511 websites and mobile apps?		
Information/Features	***Frequency***	***Percent***
Travel-At-A-Glance/Road report	1	0.28
Construction	7	1.93
Incidents	1	0.28
Winter driving conditions	19	5.25
Traffic speeds	0	0.00
Camera images/video of road	1	0.28
Electronic sign locations and messages	0	0.00
Trucker's page	0	0.00
More than 1 service	254	70.17
Other	0	0.00
No Response	79	21.82

Q14. How have you used the information you received from Iowa's 511 services?		
Trip Change Due to 511 Information	***Frequency***	***Percent***
Changed route	38	10.50
Changed departure time	22	6.08
Changed mode of travel	1	0.28
Changed stress level/feel more control on the trip	24	6.63
All that apply	177	48.90
Other	10	2.76
No Response	90	24.86

Q15. During the past 6 months, how many hours did you drive on a typical work day (or weekday)?		
Hours of Driving	***Frequency***	***Percent***
Less than 1 hour	152	41.99
1-2 hours	111	30.66
2-4 hours	58	16.02
4 hours or more	37	10.22
No Response	4	1.10

Q17. What type of vehicle did you typically drive on a work day (or weekday)?		
Type of Vehicle	***Frequency***	***Percent***
Passenger car	156	43.09
SUV	83	22.93
Pickup truck	83	22.93
Van	21	5.80
Two axle single unit truck	6	1.66
Truck with 3 or more axles	4	1.10
Other	5	1.38
No Response	4	1.10

Q19. What is your age category?		
Age Group	***Frequency***	***Percent***
18-25	13	3.59
26-30	20	5.52
31-40	56	15.47
41-50	92	25.41
51-60	131	36.19
over 60	44	12.15
No Response	6	1.66

Q20. Are you an employee of the Iowa Department of Transportation?		
DOT Employee	***Frequency***	***Percent***
Yes	296	81.77
No	61	16.85
No Response	5	1.38

Q 17. What is the ZIP code of your home address?				
Zip Code	**City**	**State**	**Frequency**	**Percentage**
50010	Ames	IA	40	11.05%
50014	Ames	IA	22	6.08%
50036	Boone	IA	21	5.80%
50023	Ankeny	IA	9	2.49%
50401	Mason City	IA	9	2.49%
50021	Ankeny	IA	8	2.21%
50201	Nevada	IA	8	2.21%
50248	Story City	IA	6	1.66%
52641	Mount Pleasant	IA	6	1.66%
50009	Altoona	IA	5	1.38%
50124	Huxley	IA	5	1.38%
50138	Knoxville	IA	4	1.10%
50263	Waukee	IA	4	1.10%
50317	Des Moines	IA	4	1.10%
50703	Waterloo	IA	4	1.10%
52501	Ottumwa	IA	4	1.10%
50035	Bondurant	IA	3	0.83%
50129	Jefferson	IA	3	0.83%
50158	Marshalltown	IA	3	0.83%
50208	Newton	IA	3	0.83%
50226	Polk City	IA	3	0.83%
50613	Cedar Falls	IA	3	0.83%
50801	Creston	IA	3	0.83%
51012	Cherokee	IA	3	0.83%
52001	Dubuque	IA	3	0.83%
52057	Manchester	IA	3	0.83%
52402	Cedar Rapids	IA	3	0.83%
52772	Tipton	IA	3	0.83%
52806	Davenport	IA	3	0.83%
50046	Cambridge	IA	2	0.55%
50054	Colfax	IA	2	0.55%
50056	Colo	IA	2	0.55%
50073	Elkhart	IA	2	0.55%
50105	Gilbert	IA	2	0.55%
50130	Jewell	IA	2	0.55%
50131	Johnston	IA	2	0.55%
50236	Roland	IA	2	0.55%
50273	Winterset	IA	2	0.55%
50311	Des Moines	IA	2	0.55%
50313	Des Moines	IA	2	0.55%
50428	Clear Lake	IA	2	0.55%

Q 17. What is the ZIP code of your home address?				
Zip Code	**City**	**State**	**Frequency**	**Percentage**
50595	Webster City	IA	2	0.55%
51030	Lawton	IA	2	0.55%
51040	Onawa	IA	2	0.55%
51106	Sioux City	IA	2	0.55%
51108	Sioux City	IA	2	0.55%
51347	Lake Park	IA	2	0.55%
51503	Council Bluffs	IA	2	0.55%
51559	Neola	IA	2	0.55%
52046	Farley	IA	2	0.55%
52302	Marion	IA	2	0.55%
52403	Cedar Rapids	IA	2	0.55%
52544	Centerville	IA	2	0.55%
52748	Eldridge	IA	2	0.55%
52807	Davenport	IA	2	0.55%
50002	Adair	IA	1	0.28%
50022	Atlantic	IA	1	0.28%
50025	Audubon	IA	1	0.28%
50028	Baxter	IA	1	0.28%
50031	Beaver	IA	1	0.28%
50034	Blairsburg	IA	1	0.28%
50039	Bouton	IA	1	0.28%
50042	Brayton	IA	1	0.28%
50048	Casey	IA	1	0.28%
50051	Clemons	IA	1	0.28%
50055	Collins	IA	1	0.28%
50072	Earlham	IA	1	0.28%
50112	Grinnell	IA	1	0.28%
50125	Indianola	IA	1	0.28%
50134	Kelley	IA	1	0.28%
50144	Leon	IA	1	0.28%
50148	Liscomb	IA	1	0.28%
50156	Madrid	IA	1	0.28%
50166	Milo	IA	1	0.28%
50169	Mitchellville	IA	1	0.28%
50212	Ogden	IA	1	0.28%
50225	Pleasantville	IA	1	0.28%
50228	Prairie City	IA	1	0.28%
50244	Slater	IA	1	0.28%
50247	State Center	IA	1	0.28%

Q 17. What is the ZIP code of your home address?				
Zip Code	**City**	**State**	**Frequency**	**Percentage**
50250	Stuart	IA	1	0.28%
50266	West Des Moines	IA	1	0.28%
50276	Woodward	IA	1	0.28%
50309	Des Moines	IA	1	0.28%
50312	Des Moines	IA	1	0.28%
50314	Des Moines	IA	1	0.28%
50315	Des Moines	IA	1	0.28%
50316	Des Moines	IA	1	0.28%
50320	Des Moines	IA	1	0.28%
50323	Urbandale	IA	1	0.28%
50324	Windsor Heights	IA	1	0.28%
50327	Des Moines	IA	1	0.28%
50423	Britt	IA	1	0.28%
50436	Forest City	IA	1	0.28%
50451	Lakota	IA	1	0.28%
50468	Rockford	IA	1	0.28%
50471	Rudd	IA	1	0.28%
50501	Fort Dodge	IA	1	0.28%
50516	Badger	IA	1	0.28%
50529	Dakota City	IA	1	0.28%
50621	Conrad	IA	1	0.28%
50647	Janesville	IA	1	0.28%
50652	Lincoln	IA	1	0.28%
50658	Nashua	IA	1	0.28%
50660	New Hartford	IA	1	0.28%
50662	Oelwein	IA	1	0.28%
50677	Bremer	IA	1	0.28%
50845	Diagonal	IA	1	0.28%
50851	Lenox	IA	1	0.28%
50854	Mount Ayr	IA	1	0.28%
51016	Correctionville	IA	1	0.28%
51026	Hornick	IA	1	0.28%
51039	Moville	IA	1	0.28%
51063	Whiting	IA	1	0.28%
51104	Sioux City	IA	1	0.28%
51235	Doon	IA	1	0.28%
51248	Sanborn	IA	1	0.28%
51301	Spencer	IA	1	0.28%
51442	Denison	IA	1	0.28%
51443	Glidden	IA	1	0.28%

Q 17. What is the ZIP code of your home address?				
Zip Code	**City**	**State**	**Frequency**	**Percentage**
51501	Council Bluffs	IA	1	0.28%
51510	Carter Lake	IA	1	0.28%
51526	Crescent	IA	1	0.28%
51550	Magnolia	IA	1	0.28%
52052	Guttenberg	IA	1	0.28%
52054	La Motte	IA	1	0.28%
52060	Maquoketa	IA	1	0.28%
52101	Decorah	IA	1	0.28%
52147	Hawkeye	IA	1	0.28%
52162	Postville	IA	1	0.28%
52165	Ridgeway	IA	1	0.28%
52172	Waukon	IA	1	0.28%
52236	Homestead	IA	1	0.28%
52247	Kalona	IA	1	0.28%
52248	Keota	IA	1	0.28%
52301	Marengo	IA	1	0.28%
52327	Riverside	IA	1	0.28%
52349	Vinton	IA	1	0.28%
52358	West Branch	IA	1	0.28%
52405	Cedar Rapids	IA	1	0.28%
52531	Hiteman	IA	1	0.28%
52556	Fairfield	IA	1	0.28%
52563	Hedrick	IA	1	0.28%
52577	Oskaloosa	IA	1	0.28%
52601	Burlington	IA	1	0.28%
52627	Fort Madison	IA	1	0.28%
52638	Middletown	IA	1	0.28%
52645	New London	IA	1	0.28%
52646	Oakville	IA	1	0.28%
52730	Camanche	IA	1	0.28%
52751	Grand Mound	IA	1	0.28%
52761	Muscatine	IA	1	0.28%
52766	Nichols	IA	1	0.28%
55904	Rochester	MN	1	0.28%
57038	Jefferson	SD	1	0.28%
57049	Dakota Dunes	SD	1	0.28%
63556	Milan	MO	1	0.28%
No Response	No Response	No Response	10	2.76%

Q18. What is the ZIP code of the place you travel to most often on weekdays?				
Zip Code	**City**	**State**	**Frequency**	**Percentage**
50010	Ames	IA	144	39.78%
50021	Ankeny	IA	20	5.52%
50401	Mason City	IA	11	3.04%
52556	Fairfield	IA	9	2.49%
50014	Ames	IA	8	2.21%
50801	Creston	IA	7	1.93%
52404	Cedar Rapids	IA	7	1.93%
50022	Atlantic	IA	5	1.38%
51102	Sioux City	IA	5	1.38%
51501	Council Bluffs	IA	4	1.10%
52501	Ottumwa	IA	4	1.10%
50158	Marshalltown	IA	3	0.83%
50208	Newton	IA	3	0.83%
52003	Dubuque	IA	3	0.83%
52544	Centerville	IA	3	0.83%
52641	Mount Pleasant	IA	3	0.83%
52761	Muscatine	IA	3	0.83%
52806	Davenport	IA	3	0.83%
50036	Boone	IA	2	0.55%
50201	Nevada	IA	2	0.55%
50309	Des Moines	IA	2	0.55%
50321	Des Moines	IA	2	0.55%
50423	Britt	IA	2	0.55%
50501	Fort Dodge	IA	2	0.55%
50588	Storm Lake	IA	2	0.55%
50613	Cedar Falls	IA	2	0.55%
51040	Onawa	IA	2	0.55%
51104	Sioux City	IA	2	0.55%
51106	Sioux City	IA	2	0.55%
51360	Spirit Lake	IA	2	0.55%
52001	Dubuque	IA	2	0.55%
52057	Manchester	IA	2	0.55%
52101	Decorah	IA	2	0.55%
52172	Waukon	IA	2	0.55%
52240	Iowa City	IA	2	0.55%
52345	Urbana	IA	2	0.55%
52772	Tipton	IA	2	0.55%
20010	Washington	DC	1	0.28%
50009	Altoona	IA	1	0.28%

Q18. What is the ZIP code of the place you travel to most often on weekdays?				
Zip Code	**City**	**State**	**Frequency**	**Percentage**
50023	Ankeny	IA	1	0.28%
50047	Carlisle	IA	1	0.28%
50126	Iowa Falls	IA	1	0.28%
50129	Jefferson	IA	1	0.28%
50131	Johnston	IA	1	0.28%
50138	Knoxville	IA	1	0.28%
50144	Leon	IA	1	0.28%
50228	Prairie City	IA	1	0.28%
50265	West Des Moines	IA	1	0.28%
50271	Williams	IA	1	0.28%
50306	Des Moines	IA	1	0.28%
50313	Des Moines	IA	1	0.28%
50314	Des Moines	IA	1	0.28%
50317	Des Moines	IA	1	0.28%
50320	Des Moines	IA	1	0.28%
50322	Urbandale	IA	1	0.28%
50438	Garner	IA	1	0.28%
50511	Algona	IA	1	0.28%
50525	Clarion	IA	1	0.28%
50614	Cedar Falls	IA	1	0.28%
50630	Fredericksburg	IA	1	0.28%
50658	Nashua	IA	1	0.28%
50677	Bremer	IA	1	0.28%
50703	Waterloo	IA	1	0.28%
50854	Mount Ayr	IA	1	0.28%
51101	Sioux City	IA	1	0.28%
51108	Sioux City	IA	1	0.28%
51247	Rock Valley	IA	1	0.28%
51248	Sanborn	IA	1	0.28%
51301	Spencer	IA	1	0.28%
51442	Denison	IA	1	0.28%
51503	Council Bluffs	IA	1	0.28%
51546	Logan	IA	1	0.28%
51555	Mo Valley	IA	1	0.28%
52002	Dubuque	IA	1	0.28%
52040	Dyersville	IA	1	0.28%
52242	Iowa City	IA	1	0.28%
52302	Marion	IA	1	0.28%

Q18. What is the ZIP code of the place you travel to most often on weekdays?				
Zip Code	**City**	**State**	**Frequency**	**Percentage**
52353	Washington	IA	1	0.28%
52401	Cedar Rapids	IA	1	0.28%
52402	Cedar Rapids	IA	1	0.28%
52403	Cedar Rapids	IA	1	0.28%
52411	Cedar Rapids	IA	1	0.28%
52601	Burlington	IA	1	0.28%
52652	Swedesburg	IA	1	0.28%
52655	West Burlington	IA	1	0.28%
52722	Bettenford	IA	1	0.28%
52732	Clinton	IA	1	0.28%
52742	De Witt	IA	1	0.28%
52809	Davenport	IA	1	0.28%
68102	Omaha	NE	1	0.28%
No Response	No Response	No Response	26	7.18%

APPENDIX F: FEEDBACK FROM ONLINE SURVEY RESPONDENTS

ID	Q 22. What new features or services would you like the Iowa DOT to add to its 511 Traveler Information System?
8	On the state borders, It would be nice to show a little bit of the next state's road conditions for continuity (example: I often travel from Iowa to Illinois through the Quad Cities)
14	Don't know
19	None.
21	I'm a big fan of Google Traffic. If you have some great idea to improve that....
33	Unknown
35	tie in local events so you don't end up in a parade
47	More cameras for each location, a variety of view choices.
51	don't use often enough to say
60	Add the plow cam images from the Track-a-Plow site to 511.
81	Improve the telephone option of 511. Make the mobile apps more real-time in nature.
84	Appreciate the system, especially like the timeframe for construction- ie roadwork from this date to that date.
85	It would be nice to be able to put in a route and get alternate choices for other routes that would avoid construction/traffic delays.
87	Texting alerts
89	Be able to enter my normal route and get an alert if there's a traffic accident or closure that would alter my route.
96	Like amber alerts if there is road closures or extreme conditions / blockages / accidents
97	Portable CMS board messages.
98	Put construction project info on 511.
100	N.A. Due to never seeing Iowa 511 before
102	N/A
106	County Road construction projects and road conditions.
109	The use of more stationary or plow cameras would be beneficial in winter operation situations. Rural primary routes seem to be spottier in regards to these types of features, so more attention to these areas would be good.
110	I would like to see more RWIS sights in Northwest Iowa.
111	None - it is sufficient as is. Spend money on road repair.
112	I'm happy with what is provided.
120	Delay times for projects with pilot cars or one lane traffic would be helpful. Length of detours would also be helpful.
124	A way for people who do not have smartphones or any phone to get the information.
132	I don't know.
141	Having current and future events not land on top of each other such as lane closures during day(one event), then detoured to ramps on selected nights(second event) Each event on same location.
143	Surface Forecast
150	Combine the 511 site with the construction projects website information. 511 is too vague. Or have a link to the project website from 511 if a user wants additional information.

ID	Q 22. What new features or services would you like the Iowa DOT to add to its 511 Traveler Information System?
151	It would be really nice if we could incorporate Local Public Agencies (counties and cities) into the 511 apps, etc.
156	Multiple family members have asked if there is a way to see the time that the weather-related road conditions were last updated on the 511 website. I think that is a feature that should be added (to each road segment perhaps or however it is recorded?) so that travelers know whether roads are clear/partially covered with snow and ice/or completely covered with snow and ice at that moment or if that information might be outdated.
159	511 county road data, this is sometime my first choice of route or alt. route
160	I don't really use it much. However I think I will check in on it. The little use I have experienced It seemed very good.
163	county road information real time information - advance notifications mile posts better clarification/description of the route (which part of the route) that is closed and the detour
164	I wish it was more current. I have seen electronic signs indicating an accident ahead and call 511 and it will say the route is clear with no traffic.--wish the information given was real time. hard to use the phone service--would be cool if the phone service could sync somehow to my location on my cell
166	None
172	On days of weather issues it would be nice to have radar or weather warnings notice.
173	The detour information is not too clear.
174	na
177	allow people to sign up for specific alerts when there is a road closure or issue on a road(s) we specify
186	Show/list low clearance (<15 ft.) or other travel restrictions for trailers, 5th wheels and/or motor homes. Any other information/restrictions that would apply to RV type vehicles.
187	More access to road cameras. Some not on website
188	Travel times map like Google maps. easier to access road reports
193	Pot holes! We have a motorcycle! Did not notice the weather guide! Will be looking that up soon!
202	road construction
205	Maybe have access or a link to a weather radar.
211	Don't use
220	Link to other states with a similar 511 app (I've searched and downloaded from iTunes on my own, but should be nicer to see list if possible from the Iowa app)
227	PUBLIC TRANSPORTATION AVAILABILITY.
228	Possibly links to other state 511 service
233	It is to slow. Especially when panning and regenerating the screen.
238	Rideshare (Carpool, Vanpool), and public transit trip planner
245	Timely updates on traffic incidents, especially when there are delays!
248	Allow me to have a personal setting "home" page - i.e., East Central Iowa. I most often want this local area information and the map defaults to Central Iowa.

ID	Q 22. What new features or services would you like the Iowa DOT to add to its 511 Traveler Information System?
252	The continued improvements have been great and easy to follow. Have had occasional comments that our traveler page was so easy to use compared to other states.
298	None - great the way it is.
302	None. The system is flawed.
306	Push lanes closure messages using geo-fencing
320	County highway closures/detours
322	More road cameras
323	Integration with google maps for traffic cameras and message signs. It would also be nice to set up specific notifications on the phone app (such as I235 WB between 4-5 M-F).
327	Integrate with track-a-plow so it's all on the same map.
328	One aspect of my route decision process is vehicle density. But that factor comes from my previous experience based on time of day on certain roads. A graphical representation similar to speeds would be beneficial. Density is not always a factor in arrival times, rather is correlated to frequency and intensity of accidents.
329	It should be more integrated with other DOT applications. Why do we have a separate app for snow plow location and another for construction project information?
330	Make it easier to type in an address and see around that area.
337	More information on the status of non-interstate roads.
340	More road cameras, bridge cameras.
346	Deleted the app a while ago because I found it was not easy to use, it appears different so I will re-install later. How about an app tied to phone's GPS with text alerts of incidents in your area if the app is activated, but an app that will run in the background so it doesn't use too much battery or data. (ex. program "Ames to Omaha", it uses Google maps or something similar, uses your phone's GPS and runs in background. If it gets a maintenance or police report of an accident, weather, flood, construction it will text you what delay is, expected time of delay if known, and possible routes. Not the best idea if driving alone but great for a family traveling so a non-driving person can play co-pilot.
353	It would be nice to see higher quality video streams from traffic cams, especially at night. Also more traffic cams in outlying areas like Knoxville, Pleasantville, Pella (Always needs fixed or cleaned, so it's useless), etc. Especially for winter road conditions and traffic.
357	It's a great system
359	none as of now
360	add more cameras to routes would help

ID	23. Do you have any ideas or comments on how we can improve the Iowa 511 Traveler Information System?
1	
8	The site is great, i find it very useful in the winter because i live on a gravel road and often can't tell if i should leave the house or stay put. I don't really use it for traffic congestion purposes. I'm sorry but i think the highway overhead digital signs are a waste of money. I can understand having them around large cities like Des Moines but no other parts of Iowa.
14	No
18	Reduce the clutter on the website.
19	Just get the word out more. I had no idea about 511.
21	Love the snow plow cams. I do not like your tweets regarding road construction/accidents. I like the idea but I think it is a bad format. Leading with the Highway # is not useful to me. US 30 could be Missouri Valley or Cedar Rapids. Lead with the near city name. Here is now: US 63: Intermittent lane closure from County Road G17 (near Montezuma) to I-80 (near Malcom). What I would like. Near Malcom, and Near Montezuma. US 63: Intermittent lane closure from County Road G17 to I-80 Same stuff, but I know where I am going, the city name is what catches the eye when scrolling thru all my tweets.
45	More details of winter road conditions updated more often
47	A larger view of the traffic cameras. The new smaller format is hard to use. You can't see smaller details.
51	don't use often enough to say
56	I did not know that it existed. Make it more easily seen or available.
60	Include warnings on the presence of paint crews since they move very slowly. This might be a good thing to include on the DMS' as well so that drivers know there is a slow moving paint train X# miles ahead on whatever side of the road.
81	Improve the telephone option so it's not so clunky.
84	I was not aware that travel times are listed on the 511 site.
85	It would be nice to incorporate closures that are directly off of a major interstate. For example, C57 is closed in both directions off of Hwy 218. There is no indication of that on the map. It would help to know there is a detour.
96	I am unaware if there is a voice message system that I could listen to on the way to work because I will NOT access my smart phone apps while I am driving
98	Put construction project info on 511.
100	I had never heard of this system before so making everyone more aware of it would help this system in my opinion
101	None.
102	N/A
108	To made up to the minute road closer more on time. I was traveling to Omaha and I looked at 511 and is didn't show road work be the valley and when I got down there was a bridge paint job going on that had traffic back up for about 30 min.

ID	23. Do you have any ideas or comments on how we can improve the Iowa 511 Traveler Information System?
109	The efforts for more real time information are the best improvement we can provide the travelling public. Winter road condition updates have become much more "real time" in recent winters and this is very important for travelers who are on the road in the early morning hours. Previously updates seemed to often end with ISP at about 11 pm and not update again until 6 or 7 am the next morning, when many of the commuters already have left for work uncertain what the condition actually was. Much better now.
111	It is good just the way that it is.
112	Maybe update things more frequently. It seems some mornings that the app is behind real-time traffic.
114	Increase the bandwidth during winter months. There's good information there, but when there are snow events the site's inaccessible, which defeats the entire purpose.
124	Winter weather information could be better.
134	Additional, more descriptive categories of snow/ice cover on roadways similar to 511's earlier categories. The current few categories do not give enough road condition information.
141	Leave traffic impact descriptions more value so that they are more accurate. (Alternating lane closures) as it is difficult to keep up with exactly where the contractor is and which side they choose to work. Especially at night or with no inspectors.
150	Have a link to the construction project website on 511 so a user can access additional information.
152	I am thankful for the Iowa 511 Traveler Information, it helps with trip planning both professionally and personally.
159	County construction work more so.
160	Not at this time.
163	better clarification/description of the route (which part of the route) that is closed and the detour county road information real time information - advance notifications mile posts
168	Make sure upcoming closures are on both the traveler's page and the trucker's page. Make sure the site works with as many different versions of browsers as possible.
174	N/A
192	Be more clear and accurate with the exact locations of closures and work zones. A point or line on a map does not always accurately convey which interchanges, ramps, intersections or cross-streets are open and which are closed.
193	pot holes reporting...they are scary when on the bike
204	Speed/loading improvements to the site during heavy site traffic. It can be frustrating to not get the site to work when it cannot handle the capacity, therefore I go elsewhere to get my information.
205	Just keep it reliable and up to date.
222	More use of electronic signs in high traffic areas
227	PUBLIC TRANSPORTATION FROM AMES TO DES MOINES.
238	Include information for more transportation modes - Rideshare resources and public transit trip planner, bicycle trails, airports, passenger rail lines and stations.
245	Timely information would be nice.
248	Picking cameras to view by route is clumsy. Any way to speed that up?

ID	23. Do you have any ideas or comments on how we can improve the Iowa 511 Traveler Information System?
249	More signs or advertising materials at rest stops to make more people aware of this service.
250	Keep it simple and easy to use and understand.
253	The part of the system that frustrates me the most is that the winter driving conditions are so terribly outdated most of the time. Last reports are sometimes MANY HOURS behind actual time. Wish there were a way to make them more up-to-the-minute. This is the part of the system I find the most undependable to rely on.
274	Make more user friendly.
289	More consistent construction information between office's, and wording for the construction.
298	Not at this time.
302	Junk the 511, and get a more user friendly program.
306	Love it..
311	Fix 'your session has expired' when clicking on links that are posted to Facebook
318	Advertise more about 511. I personally thought it was only a thing to call in to which I don't do but now that i know there is an app i can put on my phone I will definitely use it!
319	Need better location descriptions of projects. For example: the description for work on US 67 in Bettendorf is poor. "Between Business US 61 and US 30 (near Bettendorf)" is a 33 mile stretch! Actually it is in Bettendorf between 10th St and 18th St; a half mile stretch. Project entries need to be updated whenever there is a change in lane availability; not just once at the beginning of a project. For example on interstate patching projects the location of nightly lane closures should be given; not just the entire project area for the entire contract period.
320	Better wintertime crash reporting like MnDOT
322	None
323	The travel time message signs are great. It would be nice to see the stay on all the time not just during rush. It would also be nice to see them in more areas. IOS app is great but crashes often.
324	Keep the winter road map AS IS please. You could ask other states to make theirs' as good. This question is why I wanted to take this survey. In winter the Iowa 511 road color map is a great tool. Thank you.
327	Push all of the information to Google Maps. With Android Auto coming out now, pretty soon we won't even be able to easily use 511 in our cars - it'll just be Maps and maybe Waze. Obviously some people will still need the old 511 service, but the future seems to be pushing the data to the major providers like Google and Apple.
328	This camera http://hb.511ia.org/#cameras/albumView/214417 is misnamed and located incorrectly on the map. I tried to tell @iadot about it. The response said I was incorrect. If you just look at the picture, you can see that the camera is on the other side of Black Hawk Creek. And if you drive under highway 218 on Duryea Street, you can look up at the camera. Even with Google Maps, when one submits a correction, there is eventual follow through.
329	Integrate it with other DOT applications. Find a way to be more precise with the condition information. Partially covered doesn't really tell you if the road is slippery. There should be one interface for DOT field staff to enter information into all systems.

ID	23. Do you have any ideas or comments on how we can improve the Iowa 511 Traveler Information System?
346	I would pay $5 or so for an app that doesn't bombard me with ads and can give me real-time traffic data, but not too much. I would like the data on MY trip from Ames to Omaha, but don't need real-time data for stuff an hour behind or don't need data on someone else's trip from Waterloo to Dubuque. Maybe tying a text message to the DMS boards would be easier instead of my app idea? I don't know how necessary it is to have hundreds of cameras up around roads and on trucks. You either gets pics of cars sitting still or snow packed cameras. Spend more money and effort with a real-time map/GPs based driving app to supplement on-board or aftermarket Garmin-type devices. ALSO:
353	Higher quality video streams from traffic cams, ie. Higher res video. Maybe make the res selectable like on YouTube so if you have a slow connection you can pick a lower quality stream.
356	As per construction projects, removed when not impacted travel lanes.
360	Everything looks good, speed and accuracy would is always beneficial.

APPENDIX G: MVD SURVEY QUESTIONNAIRE

This survey is being conducted by the Institute of Transportation at Iowa State University to help the Iowa DOT improve its 511 Traveler Information System and meet the needs of the driving public. Please circle one answer for each of the following questions. Your answers are voluntary and anonymous. Thank you!

Congestion/Road Construction & Closure

1. In the past 6 months, which service did you use most often to get **CONGESTION/ROAD CONSTRUCTION & CLOSURE** and **other traffic incident** information?

   0 = None [Go to Q5] 3 = Iowa 511 phone
   1 = In-car navigation 4 = Iowa 511 online/app
   2 = Google Maps 5 = Other:_____

2. When did you mostly use this service?

   1 = Before a trip 3 = During traffic congestion
   2 = During a trip 4 = Other:_____

3. How often did you use this service in the past 6 months?

   1 = Almost every day 3 = Occasionally
   2 = Once per week 4 = Other:_____

4. Why do you use this service rather than other alternatives?

   1 = Easiest to use 3 = Its unique features
   2 = It's accurate 4 = Other:_____

Weather-Related Travel Information

(winter road conditions, travel advisories, etc…)

5. In the past 6 months, which service did you use most often to get **WEATHER-RELATED TRAVEL** information?

   0 = None [Go to Q9] 3 = Iowa 511 phone
   1 = In-car navigation 4 = Iowa 511 online/app
   2 = Google Maps 5 = Other:_____

6. When did you mostly use this service?

   1 = Before a trip 3 = During traffic congestion
   2 = During a trip 4 = Other:_____

7. How often did you use this service in the past 6 months?

   1 = Almost every day 3 = During severe weather
   2 = Most days in winter 4 = Other:_____

8. Why do you use this service rather than other alternatives?

   1 = Easiest to use 3 = Its unique features
   2 = It's accurate 4 = Other:_____

Travel Time and Route Information

(which roads to use & how long it will take…)

9. In the past 6 months, which service did you use most often to get **TRAVEL TIME/ROUTE** information?

   0 = None [Go to Q13] 3 = Iowa 511 phone
   1 = In-car navigation 4 = Iowa 511 online/app
   2 = Google Maps 5 = Other:_____

10. When did you mostly use this service?

    1 = Before a trip 3 = During traffic congestion
    2 = During a trip 4 = Other:_____

11. How often did you use this service in the past 6 months?

    1 = Almost every day 3 = Occasionally
    2 = Once per week 4 = Other:_____

12. Why do you use this service rather than other alternatives?

    1 = Easiest to use 3 = Its unique features
    2 = It's accurate 4 = Other:_____

Your Driving Patterns

13. During the past 6 months, how many hours did you drive on a typical work day (or week day)?

    1 = Less than one hour 2 = One to two hours
    3 = Two to four hours 4 = Four hours/day or more

14. What is the Zip Code of your home address?

    Zip Code:_____

15. What is the zip code of the place you travel to most often on weekdays (work, errands, school)?

    Zip Code:_____

Please continue to the back

16. What is your age category?

1 = 18-25 2 = 26-30 3 = 31-40
4 = 41-50 5 = 51-60 6 = Over 60

17. Are you an employee of the Iowa Department of Transportation?

1 = Yes 2 = N

18. Have you ever used **Iowa 511** services?

1 = No [Go to Q21]
2 = Yes

19. Please circle all the types of **Iowa 511** services that you have used.

1 = 511 phone
2 = 511 website
3 = 511 mobile app
4 = 511 Twitter /Facebook

20. What information do you use from **Iowa 511**? Please circle all that apply.

1 = Traffic speeds on highways (real time)
2 = Road reports (road conditions, closures, or warnings due to weather or construction)
3 = Travel times / Routes
4 = Camera images of roads (real time)
5 = Electronic sign locations and messages
6 = Other:_____

21. What new features or services would you like the Iowa DOT to add to its **511** system?

22. Do you have any ideas or comments on how we can improve the **Iowa 511** Traveler Information System?

Thank you for your participation! We are very grateful for your help with this important project.

APPENDIX H: ONLINE SURVEY QUESTIONNAIRE

Iowa 511 Online Survey

This short survey will help Iowa Department of Transportation improve its 511 Traveler Information System (www.511ia.org) and meet the needs of the driving public. Your answers are voluntary and anonymous.

1. In the past 6 months, how often did you use the following services to get CONGESTION, ROAD CONSTRUCTION & CLOSURE or other traffic incident information? Please go to Question 4 if you didn't use any service.

	More than 3 times per week	2-3 times per week	Once per week	Occasionally	Never
511 phone service	○	○	○	○	○
511 web/app	○	○	○	○	○
Websites other than 511	○	○	○	○	○
Mobile apps other than 511	○	○	○	○	○
In-vehicle navigation	○	○	○	○	○
Radio	○	○	○	○	○
TV	○	○	○	○	○
Electronic signs on highways	○	○	○	○	○
Something else	○	○	○	○	○

2. When did you most often use the service(s) selected in Question 1 above?

- ○ Before a trip
- ○ During a trip
- ○ During traffic congestion
- ○ Other: _____

3. Why did you use the service(s) selected in Question 1 rather than other alternatives?

- ○ Easiest to use
- ○ Accuracy
- ○ Unique features
- ○ My friend uses it
- ○ Not aware of other services
- ○ Other: _____

Continue »

12% completed

Powered by Google Forms

This content is neither created nor endorsed by Google.
Report Abuse - Terms of Service - Additional Terms

Iowa 511 Online Survey

4. In the past 6 months, how often did you use the following services to get WEATHER-RELATED TRAVEL information? Please go to Question 7 if you didn't use any service.

	Almost every day	Most days in winter	Occasionally	Never	Other
511 phone service	○	○	○	○	○
511 web/app	○	○	○	○	○
Websites other than 511	○	○	○	○	○
Mobile apps other than 511	○	○	○	○	○
In-vehicle navigation	○	○	○	○	○
Radio	○	○	○	○	○
TV	○	○	○	○	○
Electronic signs on highways	○	○	○	○	○
Something else	○	○	○	○	○

5. When did you most often use the service(s) selected in Question 4?

- ○ Before a trip
- ○ During a trip
- ○ During traffic congestion
- ○ Other: _____

6. Why did you use the service(s) selected in Question 4 rather than other alternatives?

- ○ Easiest to use
- ○ Accuracy
- ○ Unique features
- ○ My friend uses it
- ○ Not aware of other services
- ○ Other: _____

« Back Continue »

25% completed

Powered by Google Forms

This content is neither created nor endorsed by Google.
Report Abuse - Terms of Service - Additional Terms

Iowa 511 Online Survey

7. In the past 6 months, how often did you use the following services to get TRAVEL TIME information? Please go to Question 10 if you didn't use any service.

	More than 3 times per week	2-3 times per week	once per week	Occasionally	Never	Other
511 phone service	○	○	○	○	○	○
511 web/app	○	○	○	○	○	○
Websites other than 511	○	○	○	○	○	○
Mobile apps other than 511	○	○	○	○	○	○
In-vehicle navigation	○	○	○	○	○	○
Radio	○	○	○	○	○	○
TV	○	○	○	○	○	○
Electronic signs on highways	○	○	○	○	○	○
Something else	○	○	○	○	○	○

8. When did you most often use the service(s) selected in Queston 7 above?

- ○ Before a trip
- ○ During a trip
- ○ During traffic congestion
- ○ Other: _____

9. Why did you use the service(s) selected in Question 7 rather than other alternatives?

- ○ Easiest to use
- ○ Accuracy
- ○ Unique features
- ○ My friend uses it
- ○ Not aware of other services
- ○ Other: _____

« Back Continue »

37% completed

Powered by Google Forms

This content is neither created nor endorsed by Google.
Report Abuse - Terms of Service - Additional Terms

Iowa 511 Online Survey

10. What is the main WEBSITE you use to get traffic information?

- None
- Iowa 511 website
- Google Maps
- MapQuest
- Waze
- Local TV/Radio websites
- Social media (Facebook, Twitter, etc.)
- Other:

11. What is the main MOBILE APP you use for traffic information?

- None
- Iowa 511 app
- Google Maps app
- MapQuest app
- Waze app
- Beat the traffic
- Social media (Facebook, Twitter, etc.) apps
- Other:

« Back Continue »

50% completed

Powered by Google Forms

This content is neither created nor endorsed by Google.
Report Abuse - Terms of Service - Additional Terms

Iowa 511 Online Survey

12. Please select all of the types of Iowa 511 services that you have EVER used. If you have never used Iowa 511, please go to Question 15.

- [ ] 511 phone service
- [ ] 511 website
- [ ] 511 mobile app
- [ ] 511 Twitter/ Facebook
- [ ] 511 Personalized email/text alert
- [ ] Other: _____

13. What information do you use from Iowa 511 websites and mobile apps? Please check all that apply.

- [ ] Travel At-A-Glance/ Road report (incidents, construction, weather warning, and other states' info)
- [ ] Construction (roadwork, closure, restrictions, etc.)
- [ ] Incidents (closure due to accident)
- [ ] Winter driving conditions
- [ ] Traffic speeds
- [ ] Camera images/video of road
- [ ] Electronic sign locations and messages
- [ ] Truckers' page
- [ ] Other: _____

14. How have you used the information you received from Iowa's 511 services? Please select all that apply.

- [ ] Changed route
- [ ] Changed departure time
- [ ] Changed mode of travel
- [ ] Changed stress level/ feel more control on the trip
- [ ] Other: _____

« Back Continue »

62% completed

Powered by Google Forms

This content is neither created nor endorsed by Google.
Report Abuse - Terms of Service - Additional Terms

Iowa 511 Online Survey

15. During the past 6 months, how many hours did you drive on a typical work day (or weekday)?

- Less than 1 hour
- 1 to 2 hours
- 2 to 4 hours
- 4 hours or more

16. What type of vehicle did you typically drive on a work day (or weekday)?

- Passenger car
- SUV
- Pickup truck
- Van
- Two-Axle single unit truck
- Truck with three or more axles
- Other:

17. What is the ZIP code of your home address?

18. What is the ZIP code of the place you travel to most often on weekdays (work, errands, school, etc.) ?

« Back Continue »

75% completed

Powered by Google Forms

This content is neither created nor endorsed by Google.
Report Abuse - Terms of Service - Additional Terms

Iowa 511 Online Survey

19. What is your age category?

- 18-25
- 26-30
- 31-40
- 41-50
- 51-60
- over 60

20. Are you an employee of the Iowa Department of Transportation?

- No
- Yes

21. How do you access the Internet? Please select all that apply.

- [ ] I have Internet access on my smartphone / tablet
- [ ] I have Internet access at work
- [ ] I have Internet access at home
- [ ] I don't have internet access
- [ ] Other:

« Back Continue »

87% completed

Powered by Google Forms

This content is neither created nor endorsed by Google.
Report Abuse - Terms of Service - Additional Terms

Iowa 511 Online Survey

22. What new features or services would you like the Iowa DOT to add to its 511 Traveler Information System?

23. Do you have any ideas or comments on how we can improve the Iowa 511 Traveler Information System?

24. If you would like to be contacted to further discuss the above, please provide your name and a phone number or email address.

« Back Submit

Never submit passwords through Google Forms.

100%: You made it.

Powered by Google Forms

This content is neither created nor endorsed by Google.

Report Abuse - Terms of Service - Additional Terms