Cost-Benefit Analysis of Implementing an Online Voter Registration System in Wisconsin

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Prepared for Brian Bell, Elections Data Manager
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Executive Summary

At the request of the Wisconsin Government Accountability Board (GAB), this analysis predicts the net present value (NPV) of implementing the online voter registration system (OVRS) outlined in Substitute Amendment 1 to Assembly Bill 225, relative to current policy. Based on our analysis, adopting online voter registration has positive net benefits of approximately $371,700 over ten years, with an annualized net benefit of approximately $44,700. We recommend that the GAB support its passage into law.

Many states are turning to online voter registration systems to reduce costs while also increasing the accuracy of voter registration rolls. Advocates of online registration support implementation based on the premise that doing so eases burdens on municipal and county clerks and their staff, reducing the time and resources required to process registration forms.

In this analysis, we monetize costs and benefits of implementing a full OVRS in Wisconsin. We consider personnel, hardware, and software required for implementation and maintenance, as well as training, and public advertising and outreach costs. We calculate the benefits of reduced costs for individuals in registering to vote and reduced costs to local governments in administering registrations, including time savings, supply costs, and labor costs.

To perform this analysis, we rely on United States Election Assistance Commission (EAC) voter registration data contained in a federal report released every two years. We examine all states that currently have an OVRS to predict future usage of online voter registration in Wisconsin. To gain an understanding of how online voter registration affects local governments, we survey Wisconsin clerks to estimate the system's effect on the costs of processing voter registration forms. We rely on detailed fiscal estimates from the GAB and Department of

Transportation (DOT) to estimate the costs of implementing and maintaining an OVRS in Wisconsin.

We expect total costs over ten years to be approximately $2.03 million. Our estimate is based on a one-time implementation cost of approximately $576,000 for GAB and DOT. This cost includes purchasing hardware, infrastructure updates, and diverging personnel time toward the project. We predict maintenance costs of approximately $812,800 over ten years. We also estimate $638,900 in advertising costs during the first year of implementation to raise awareness of the new OVRS. At the GAB's request, we also run alternative analyses considering other advertising scenarios.

We expect total benefits of the OVRS to be approximately $2.4 million over ten years. The most significant savings results from clerk staff time savings in that staff could forgo processing registrations and pursue the next best alternative use of their time. In total, time savings creates a benefit of $1.3 million. An OVRS would yield additional savings of $13,200 throughout the 10-year life of the project as clerks' offices reduce their per-application material cost. A reduction in poll worker hours would also save approximately $361,800. Voter time savings would create an additional benefit of approximately $728,900. We also estimate the scrap value of the OVRS hardware at the end of ten years to be approximately $1,500.

Overall, implementing an OVRS in Wisconsin would result in positive net benefits of approximately $404,200. Although there is inherent uncertainty in estimating benefits and costs, we are confident in our results. Our model predicts a net benefits range of -$122,800 to $944,500. Positive net benefits are realized 99.9 percent of the time. Based on this analysis, we recommend GAB support the creation of an OVRS in Wisconsin.

Introduction and Rationale

In 2008, an estimated 2.2 million eligible voters across the nation were unable to cast ballots in the general election because of problems with their voter registrations (Pew Center on the States 2010). Recently, in hopes of addressing this problem, there has been a push to modernize states' paper-based registration systems, which "impose unnecessary costs and administrative burdens on state and county election offices" (Pew Center on the States 2010, 1).

Arizona became the first state in the nation to implement an online voter registration system (OVRS) in 2002. Since then, twelve more states have started offering paperless registration and six more states have passed legislation authorizing the creation of an OVRS (NCSL 2013a). Online voter registration is believed to reduce labor costs and improve efficiency of voter registration (Project Vote 2013). However, implementing an OVRS does incur infrastructure and maintenance costs.

In September 2012, the Wisconsin Government Accountability Board (GAB), the body that oversees elections in Wisconsin, established the My Vote Wisconsin website, a partial OVRS. In June 2013, the Wisconsin State Assembly passed Assembly Substitute Amendment 1 (ASA 1) to Assembly Bill 225 (AB 225), which would mandate the GAB to create and maintain "a secure Internet site" where voters with appropriate identification from the Department of Transportation (DOT) can register to vote online (Wisconsin Legislative Council 2013). ASA 1 maintains existing voter registration methods, but would add the option of a complete OVRS. At the request of the GAB, we perform a cost-benefit analysis of implementing the OVRS outlined in ASA 1 to AB 225.

Current Policy

Wisconsin voters can register to vote by mail or in person at their municipal clerk's office, by a Special Registration Deputy (SRD) in their municipality, at the polling place on Election Day, or through My Vote Wisconsin, a partial OVRS that allows voters to fill out all registration information online, print out the form, and submit it via their method of choice. With the exception of Election Day registration (EDR) and registering in-person in the clerk's office during the closed registration period, each of these methods must be completed during the open registration period, which closes 20 days prior to the election (GAB 2012b). All methods require voters to have lived at their current address for at least 28 days prior to an election and some also require proof of residence.

With the exception of registering using My Vote Wisconsin, all of these methods require manual data entry from the registration forms into Wisconsin's Statewide Voter Registration System (SVRS) as mandated by the Help America Vote Act of 2002 (HAVA) (LAB 2007). Municipal clerks verify all new registrations and updates, except in-person registrations, through a United States Postal Service mailing to the registration address. For more information regarding Wisconsin voter registration, please see Appendix B.

Assembly Substitute Amendment 1 to Assembly Bill 225

The alternative to current policy is Assembly Substitute Amendment 1 (ASA 1) to Assembly Bill 225 (AB 225). It would allow voters with a current and valid Wisconsin driver's license or Wisconsin DOT-issued identification card to register to vote electronically on a secure website maintained by the GAB up to 20 days prior to Election Day (Wisconsin Legislative Council 2013). Under this new system, individuals would fill out a standardized voter registration application form online and the GAB would use the DOT's existing database to

verify the accuracy of the information submitted. As part of the online process, the registrant would also give the DOT permission to forward his or her electronic signature to the GAB, so that the GAB could use this in place of the "wet" ink signature currently required by law (Wisconsin Legislative Council 2013).

The completed registration would be verified at multiple stages. First, the amendment mandates a synchronization of the agencies' databases to facilitate instantaneous verification and flagging of irregularities, such as multiple addresses or dates of birth under a single name. The notification of an error would trigger an investigation by the GAB, rendering the application incomplete until the issue is resolved (Wisconsin Legislative Council 2013).

To further authenticate the accuracy of online submissions, the bill retains the current requirement of verifying registrations by sending letters or postcards to the registrant through First-Class Mail (Wisconsin Legislative Council 2013). The online system would also allow registered voters to change their information online up to 20 days prior to an election. Administrative procedures and implementation logistics would be addressed during the administrative rulemaking process. Subsequent to passage into law, provisions of AB 225 as amended would take effect January 1, 2015.

Determination of Standing

As voter registration falls under the purview of the states, and only U.S. citizens age 18 and older are eligible to vote, all residents of Wisconsin who are eligible to vote have standing in this analysis. State government, in particular the DOT and GAB, and county and municipal clerks' offices also have standing with respect to administrative costs.

Time Horizon and Discounting

A project time horizon of ten years provides a natural time frame to consider costs and benefits of adopting an OVRS in Wisconsin. Because many of our calculations are based on data from online voter registration systems in other states, we are only confident in predicting net benefits over a ten-year span, as the oldest OVRS (in Arizona) has only been in place since the middle of 2002. Furthermore, GAB estimates that the hardware required to implement an OVRS would have a useful life of ten years.

We predict the net benefits of implementing an OVRS over a ten-year period in terms of net present value (NPV), which equals total benefits less total costs discounted to the present. To calculate NPV we use current prices and wages to value impacts in future years. Our analysis discounts all costs and benefits at a real discount rate of 3.5 percent. Benefits and recurring costs are calculated at the mid-year of each project year one through ten. Implementation costs are calculated at the beginning of project year one. Hardware scrap value benefits are applied at the end of year ten at project termination.

Methodology

This analysis relies on data from the United States Election Assistance Commission (EAC) and also draws heavily from a survey we created and distributed to municipal and county clerks regarding processing of voter registrations. We also use estimates provided by the GAB and the DOT of costs necessary to implement the OVRS.

EAC Voter Registration Data

To predict future usage of the OVRS in Wisconsin, we use data from other states that have implemented online voter registration prior to the November 2012 general election. We make use of the EAC Election Administration and Voting Survey (EAVS), a biennial survey that

gathers information on the administration of elections for Federal office. The EAVS instrument includes state-by-state data on the number of voter registrations processed and by what methods these registrations were received.

Survey to Wisconsin Clerks

To gain a better understanding of how OVRS would affect clerks, we designed and conducted a survey of municipal clerks and county clerks in the state. While each clerk performs a variety of duties, the GAB considers clerks to be partners in ensuring open, fair, and transparent elections (GAB 2013). Most municipal clerks spend time throughout the year processing new and updated voter registration forms, while some municipalities make use of a "provider," contracting with the county clerk's office or another municipality to perform the municipality's registration duties at a negotiated cost. Clerks play an instrumental role in the voter registration process, from processing forms, to maintaining accurate voter rolls, to ensuring efficient EDR. Online voter registration potentially alters a number of duties currently performed by clerks.

The survey asked clerks to estimate the time it takes to process a registration form, the time it takes to process an illegible or inaccurate registration form, and the percentage of registration forms received by clerks that are illegible or inaccurate. Clerks were also asked to approximate how an OVRS could affect staffing in their offices and the number of poll workers hired. See Appendix S for more detailed survey results.

GAB and DOT Cost Estimates

We base the monetization of the costs of creating and maintaining the OVRS on estimates obtained from the GAB and the DOT. We use GAB fiscal estimates of ASA 1 to AB 225 to approximate general implementation and maintenance costs. We use DOT fiscal estimates

of this legislation to estimate implementation costs for the DOT specifically, and GAB fiscal estimates of various proposed policy changes to determine advertising costs. While we are confident in the accuracy of these estimates, which are based on agency knowledge and experience, we allow cost estimates to fluctuate 5 percent based on GAB recommendation.

Costs and Benefits

This section describes the relevant costs and benefits of implementing an OVRS in Wisconsin, which can be found in the table below. All costs and benefits are discounted back to net present value at 3.5 percent.

Table 1 Discounted Costs and Benefits

Costs and Benefits Discounted Over 10 Years Using 3.5% Discount Rate

Variable	0	1	2	3	4	5	6	7	8	9	10	EOY 10	Subtotal
Implemnt. Costs	(576,000)												(576,000)
Maint. Costs		(94,400)	(91,200)	(88,200)	(85,200)	(82,300)	(79,500)	(76,800)	(74,200)	(71,700)	(69,300)		(812,800)
Advert. Costs		(638,900)	-										(638,900)
Processing Savings		600	700	800	900	1,100	1,300	1,500	1,800	2,100	2,400		13,200
Clerk Labor Time Savings		63,800	69,500	78,400	91,600	109,000	129,700	153,800	180,500	209,500	240,700		1,326,500
Poll Worker Labor Savings		17,400	19,000	21,400	25,000	29,700	35,400	41,900	49,200	57,200	65,600		361,800
Reg. Cost Savings		35,100	38,200	43,100	50,300	59,900	71,300	84,500	99,200	115,100	132,200		728,900
Scrap Value												1,500	1,500
Net Present Value	**(576,000)**	**(616,400)**	**36,200**	**55,500**	**82,600**	**117,400**	**158,200**	**204,900**	**256,500**	**312,200**	**371,600**	**1,500**	**404,200**

Source: Authors

Costs

This section describes implementation and ongoing personnel, software, training, and advertising costs associated with the creation of an online voter registration system. We estimate these costs to total approximately $2.03 million over the ten-year life of the project.

GAB Implementation Costs

Personnel, Software, and Training

During the implementation phase, the GAB would face personnel, software, and training costs. Based on the GAB's estimate, the equivalent of seven positions would need to be redirected from other projects to create the hardware for an OVRS (GAB 2013c). This reallocation represents an opportunity cost to the agency that must be monetized. Each position's responsibility, number of weeks employed, blended wage rate, and cost are broken down in Appendix E. The GAB would also have to purchase three database servers, three interchange environments, and one terabyte of memory to store voter registration data and electronic signatures (GAB 2013c). See Appendix F for more detail on these costs. Next, the GAB would train employees, clerks, and staff on the OVRS system (GAB 2013c). See Appendix G for more information on training costs.

DOT Implementation Costs

Personnel

The DOT also provided estimates of its implementation costs (DOT 2013). The estimate assumes the agency would be unable to reallocate staff. Consequently, personnel would be hired and employed solely for the implementation period. A detailed description of the positions needed to implement the OVRS, their responsibilities, hours spent on the project, blended wage rates, and total costs can be found in Appendix K.

Costs incurred by the DOT are one-time expenditures. There are no software or training costs created because implementing an OVRS involves a one-time database development on an existing system for the DOT. Thus, no DOT software costs are incurred. Subsequent maintenance to the database is built into current and future agency budgets because the DOT

already employs individuals with database maintenance as a job responsibility. These personnel are hired to conduct upkeep and we assume adding to the database capabilities does not create a significant enough workload increase to justify hiring additional individuals. Therefore, no ongoing maintenance costs for the DOT are created. Combining GAB and DOT implementation costs from above, we find that implementation of OVRS would cost approximately $576,000.

GAB Maintenance Costs

Facilitating online voter registration adds a new component to the (SVRS that would require ongoing software maintenance and personnel support beyond the initial development phase (GAB 2013c). Based on the experience of developing the My Vote Wisconsin website, the GAB estimates it would have to keep four previously created positions on staff on a part-time basis (GAB 2013c). Estimates based on My Vote are valid for this analysis because of the similar project size and because the system is building upon an existing website. The breakdown of what positions are kept, their wage rates, and total personnel costs are found in Appendix I.

Software maintenance is also needed and the GAB assumes these costs equal the initial purchase prices (GAB 2013c). Combining software and personnel costs, we find a total GAB maintenance cost of $813,000 over the life of the project. For a complete explanation of total hardware and software costs, see Appendix J.

GAB Public Outreach and Advertising Costs

In order for an OVRS to reach maximum usage, we suggest GAB conduct a comprehensive outreach and advertising campaign. The campaign should focus on raising awareness about changes to the law, giving voters information about how to register to vote online (GAB 2013b). This advertising would occur over the first year of the project, cost $638,900, and is based on estimates for a similar campaign of implementing a statewide voter ID

requirement. We allow the price of this campaign to vary plus or minus 5 percent to account for fluctuations in advertising rate and the uncertainty in procuring a discounted rate for state agency public service announcements. See Appendix H for more details.

While we believe it is important for GAB to conduct a public outreach campaign, as the use of OVRS drives up benefits derived from its creation it is unclear exactly how advertisement would affect OVRS use. We interviewed election officials in seven states[1] that have implemented an OVRS and none of these states had a comprehensive advertising budget for the new system. Instead, the states relied on free media, press releases, and information posted to the state's election information website. Even with minimal advertising, state OVRS usage rates ranged from 1.5 percent to 23 percent in the first two years after implementation, making it difficult to predict the effect advertising has on OVRS usage. In order to provide GAB with a more comprehensive analysis, we provide three scenarios to explore how not advertising could affect NPV.

Scenario one assumes zero advertising expenditures delays benefits derived from the increased use of OVRS by one year. Scenario two assumes zero advertising expenditures delays benefits derived from the increased use of OVRS by two years. Scenario three assumes zero advertising expenditures has no delay effect on the benefits derived from OVRS usage. The implications of each scenario are discussed in more detail in Appendix O.

Benefits

This section describes expected benefits of creating an OVRS in Wisconsin, including fiscal and time cost savings to local government and individuals. We estimate these benefits to total approximately $2.4 million over the ten-year life of the project.

[1] Colorado, Kansas, Louisiana, Maryland, Utah, Oregon, and Washington

Reduced Local Government Costs of Processing Paper Voter Registrations

Online voter registration would reduce the number of paper registrations and registration updates processed by municipal clerks, benefiting local governments in terms of time savings and reduction in supply costs.

Reduction in Paper and Ink Costs

Adopting the OVRS would reduce the amount of paper and ink needed to print registration forms. This reduction would result in costs savings for clerks' offices. We estimate current paper and ink costs to be a total of $0.17 per double-side page and determine the annual reduction in paper based on the percentage of new and updated registrations that we project to take place online over the life of the project. This yields an estimated total cost savings of $15,400 over ten years. For detailed calculations see Appendix L.

Clerks' Time Savings

The OVRS would decrease administrative costs, as clerks would spend less time processing registration forms as registrants switch to the OVRS. Clerks would save even more time due to a reduction in the number of inaccurate registration forms they need to process because the OVRS would require registrants to enter information from a DOT identification card. This requirement would reduce errors because the online form would be instantaneously matched to the DOT database, decreasing the time spent deciphering illegible registration forms.

Based on the results of our survey to municipal and county clerks, we estimate that clerks spend, on average, approximately 5.5 minutes processing each registration form. Clerks spend an additional 3 minutes processing each inaccurate or illegible form. These problematic forms make up about 9 percent of all registration forms (see Appendix S for clerk survey details). Taking into account clerks' average hourly wage plus benefits and the predicted percentage of OVRS usage

each year of the project, we determine time cost savings of approximately $1.3 million over the life of the project. More about the methods by which we derive this benefit can be found in Appendix M (OVRS usage), Appendix N (average clerk wage and benefits), and Appendix R (annual voter registrations).

It is important to note that the estimated time savings of $1.3 million solely represents clerk staff spending less time processing registration forms and is thus a conservative estimate. If the estimated time savings is indeed realized by clerks' offices, additional savings may result from labor reductions. Based on our survey to clerks, it would be reasonable to expect the estimated time savings to be associated with a reduction of at least 20 FTE positions (see Appendix S).

Reduction in Number of Poll Workers Needed

According to our clerk survey, municipal and county clerks expect to reduce the number of poll workers hired on Election Day if the OVRS were implemented (see Appendix S for survey details). This reduction would likely result from traditional Election Day registrants switching over to OVRS usage. Based on the predicted usage of an OVRS, we estimate that the average cost savings from reductions in the number of poll workers would be approximately $362,000 over the life of the project. For a detailed analysis of the reduction in poll workers, see Appendix P.

Reduced Individual Costs to Register

Online voter registration would make registering to vote easier for individuals in that they would no longer have to travel to their clerk's office to register or send in their registration by mail.

Reduced Cost for Those Who Register in Person or by Mail

The OVRS will result in a time cost savings for those individuals who switch from registering in person to registering online. Based on data from the United States Census Bureau, we estimate that the average registrant spends 42 minutes (round trip) traveling to the clerk's office to register, or approximately the same amount of time traveling to and from work (United States Census Bureau 2012). From the EAC data, we also determine that approximately 15 percent of all registration activity occurs in person at clerks' offices during the open registration period. Those who register by mail will save money on postage by switching to the OVRS. We determine that approximately 3 percent of all registrations are submitted by mail.

We monetize the cost savings to in-person registrants by using the leisure wage of Wisconsin residents, the total annual number of registrations, and the percentage of registrations predicted to occur online. Please see Appendix Q (registration by mail and in person, and leisure wage) and Appendix R (annual voter registrations) for more detail. We monetize cost savings to "by mail" registrants by taking the price of a stamp (Appendix Q), the cost of printing a double-sided form (Appendix L), the total annual number of registrations (Appendix R), the percentage of registrations predicted to occur online (Appendix M), and assume all individuals who register by mail print the forms themselves. These calculations yield a cost savings of approximately $729,000.

Analysis and Results

Monte Carlo Sensitivity Analysis

The complexity of cost-benefit analysis (CBA) makes it difficult to calculate with certainty a point estimate for net benefits. Estimating this value would assume all benefits and costs variables are known with certainty. In practice, many of these costs and benefits are

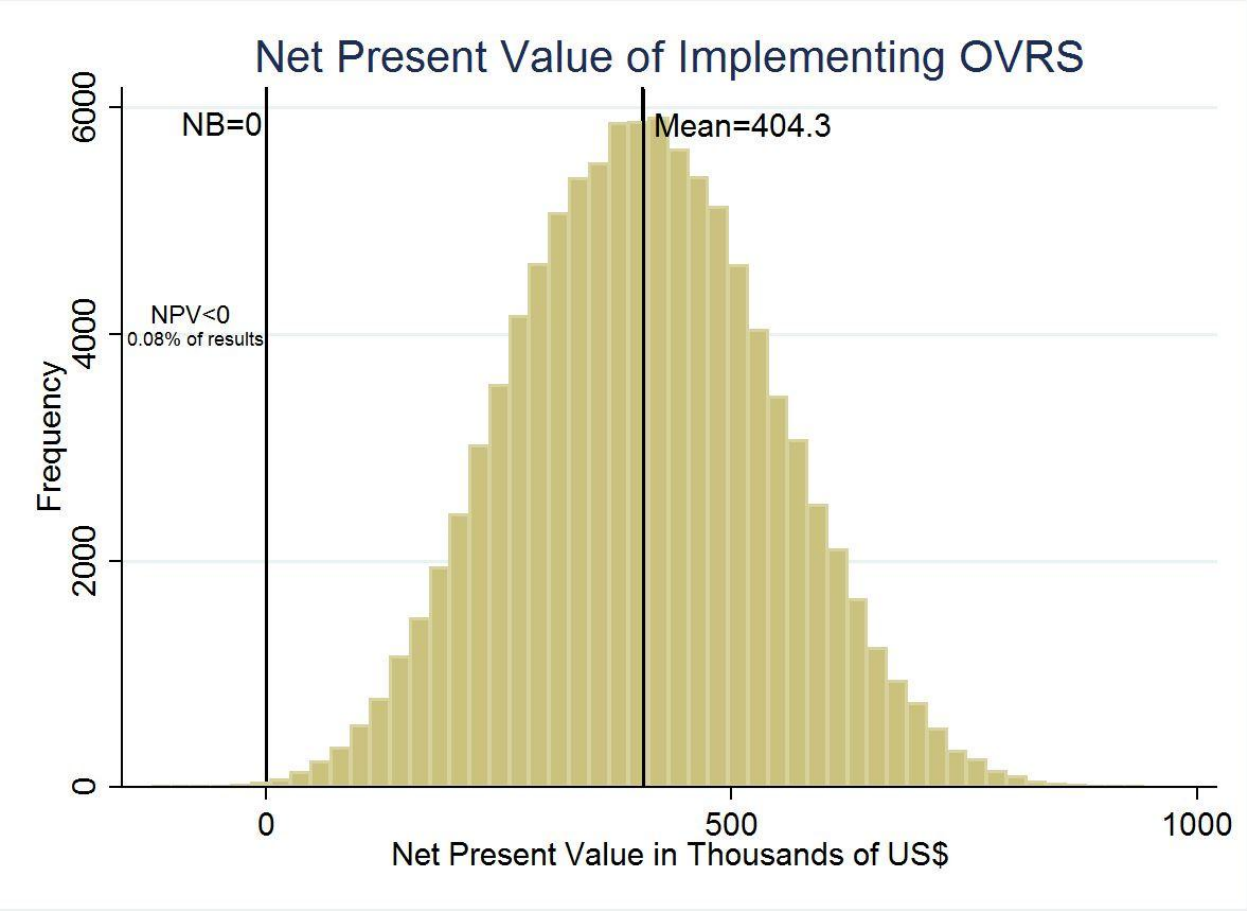
uncertain, require simplifying assumptions, and therefore have a range of plausible values. When these uncertain values are used to calculate NPV, fluctuations could greatly affect our net benefit calculation. Rather than ignore this uncertainty, our analysis uses a Monte Carlo simulation that estimates a range of net benefits by repeating randomized sampling from an assumed distribution for each uncertain variable.

This Monte Carlo analysis follows two basic steps. First, uncertain variables are assigned a uniform distribution of values. Uncertain variables include the total number of registrations, poll worker reductions, percentage of OVRS use, implementation and maintenance costs, and clerk staff time savings. All wages, postage, paper and ink costs are held constant. Next, the simulation randomly draws 100,000 values from each uniform distribution to calculate a range of net benefits. Finally, we create a histogram of the net benefit distribution (see below). In our initial Monte Carlo simulation, we use a discount rate of 3.5 percent. We repeat this process at discount rates of 2 and 5 percent to determine how net benefits depend on the chosen discount rate.

Results

Our initial Monte Carlo simulation finds a mean present value of net benefits equal to approximately $404,300. Net benefits range from -$122,800 to $944,500, and are positive 99.9 percent of the time. This equates to an annualized net benefit of $48,600. At a 2 percent discount rate, the distribution of net benefits has a mean of $575,000, ranging from $5,200 to $1.16 million. At a 5 percent discount rate, the distribution of net benefits has a mean of $254,300 and a range of -$234,500 to $755,000.

Figure 1 Histogram of Net Present Value of Implementing OVRS at 3.5 Percent Discount Rate



Source: Authors

At the GAB's request, we also examine NPV under alternative advertising scenarios discussed above. Under scenario one (no advertising and delay of the benefits derived from OVRS uptake by one year), mean net benefits are approximately $652,000 and range from $160,700 to $1.2 million with an annualized net benefit of $78,400. Under scenario two (no advertising, two year delay), mean net benefits are approximately $341,500 and range from -$132,800 to $854,800 with an annualized net benefit of $14,900. Lastly, scenario three (in which no advertising would have no effect on OVRS usage), has a mean net benefit of approximately $1.04 million with a benefit range from $530,700 to $1.6 million and an annualized net benefit $125,000.

Limitations

Performing a cost-benefit analysis requires developing assumptions and predicting uncertain costs and benefits into the future. Below we note specific limitations in analyzing costs and benefits for an OVRS in Wisconsin.

Election Assistance Commission Data

This analysis relies heavily on data from the EAC Election Administration and Voting Survey. Although we believe this is the best approach in light of the scarcity of electronic voter registration data, we have concerns about its accuracy. First, not all counties or wards reported, so in some cases aggregate state-level numbers are not based on the entirety of the state. Second, not all states report or count registrations in the same way. Registrations received through different modes (i.e., via correspondence, at the registrar's office, etc.) often do not add up to the total number of registrations received. This most likely results from inadvertent double counting or omission on the part of respondents.

Our concern is heightened for Wisconsin, where wards report both "same-day registration" and "Election Day registration" numbers. According to the GAB, Election Day registrations refer only to those registrants who went to the poll on Election Day to register or update their registration, while same-day registration refers to those who went to their clerk's office to vote early and register or update their registration at the same time. There is no way to know with certainty that respondents did not conflate these two categories, as the two terms are commonly used interchangeably.

Clerk Labor Time Savings Assumption

While we are confident that an OVRS will increase time savings for clerk office staff due to the reduced time needed to process voter registration forms, we are unclear if such time

savings will lead to reduced labor costs. Any reduction in labor due to increased time savings would increase our predicted net benefits, perhaps substantially. Our survey to municipal and county clerks provides evidence that an OVRS would likely reduce clerk office staff by at least 20 FTE positions over the ten-year project (see Appendix S). However, we recognize that it is difficult for clerks to predict accurately the effect that an OVRS would have on staffing in the future. We are more confident in our conservative estimate of reduced time savings.

Cost and Benefits Not Monetized

Insufficient time and data prevented us from monetizing all potential costs and benefits. Below is a description of the costs and benefits of OVRS implementation that are not monetized in this analysis.

Reduced Wait Time for Those Who Register on Election Day

Implementing the OVRS may reduce the number of Election Day registrations, which could reduce the time it takes to register on Election Day. However, we find no reliable estimates for wait time to register on Election Day and it is unclear how fewer people registering on Election Day would affect those who still choose to register via EDR. The protocols for EDR may differ between polling sites (i.e., EDR registrants may be able to skip the voting line altogether, which saves time in the first place and thus an OVRS would not realize any additional time savings to those individuals). Even if we were able to confidently estimate a time cost savings, we would be uncertain about applying our approximation of OVRS usage to EDR because it has been the predominant method for registering and updating registration in Wisconsin. Furthermore, no other states with an OVRS have EDR, which exacerbates this uncertainty (NCSL 2013c).

Reduced Cost of Litigating Alleged Voter Registration Fraud

Implementing an OVRS may also reduce the costs of litigating alleged voter registration fraud stemming from inaccurate or illegible registration forms. Since 2000, nine individuals have been charged with voter registration fraud in Wisconsin (News 21 2012). However, it is difficult to determine if any charges of voter registration fraud could have been avoided if an OVRS were already implemented. Additionally, we are unable to determine accurate fraud litigation costs borne by the Wisconsin Department of Corrections, Department of Justice, and the Wisconsin court system. Due to the low frequency of alleged voter registration fraud in Wisconsin, we expect any potential cost savings to be minimal.

Reduced Perception of Voter Fraud

An OVRS could reduce the perception of voter fraud by increasing the accuracy of the voter registration rolls and the requirement of OVRS users to register using a state-issued ID. Unfortunately, we were unable to monetize the perception of voter fraud or predict with confidence how it would be affected. Additionally, an OVRS may also increase the perception of registration fraud through individuals' fear of potential hacking of the system, though no states have reported any such instance of a security breach (NCSL 2013b).

Recommendation

Based on our analysis, we recommend that the GAB support adoption of an OVRS in Wisconsin. Our analysis estimates that the OVRS would provide positive net benefits of approximately $371,700 over the first ten years after implementation. Individuals who use the OVRS would realize time savings when registering to vote, local governments would reduce costs through time savings, reduced supply use, and reduced poll worker labor. Monetized benefits exceed the costs to implement and maintain an OVRS.

Online voter registration continues to gain popularity around the country, with 13 states currently utilizing an OVRS and a number of states considering OVRS adoption. Moreover, no state that has implemented an OVRS has considered overturning or replacing it. Wisconsin should not delay in joining OVRS states. We confidently recommend GAB support the adoption of an OVRS in Wisconsin as written in ASA 1 to AB 225.

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Appendices

Appendix A: Net Benefits Equation

FULL EQUATION

$$NPV = \sum_{n=0}^{10} (C_{Imp} + C_{Maint} + C_{Adv} + B_{proc} + B_{CL} + B_{PL} + B_{Reg} + B_{Scrap}) / (1+r)^{(n-.5)}$$

WHERE,

Equation #1: Implementation Costs

$$C_{Implement} = Cost_{GAB\ Implemt} + Cost_{DOT\ Implement} + Cost_{Training}$$

Equation #2: Maintenance Costs

$$C_{Maintenance} = +Cost_{GAB\ Maintenance} + Cost_{DOT\ Maintenance}$$

Equation #3: Advertising Costs

$$C_{Adv} = Cost_{Adv\ Year1}$$

Equation #4: Processing Cost Savings

$$B_{Processing} = Number_{TotalRegs} \times Percent_{OVRSTotal} \times Cost_{paper\&ink}$$

Equation #5: Clerk Labor Cost Savings

$$B_{CL} = \left(\begin{array}{c} \left(\begin{array}{c} Percent_{OVRS} \times Number_{Registrations} \\ \times Time_{GoodForms} \times Percent_{GoodForms} \times Cost_{ClerkWage} \end{array} \right) \\ + \\ \left(\begin{array}{c} Percent_{OVRS} \times Number_{Registrations} \\ \times Time_{BadForms} \times (Percent_{BadForms} + Cost_{ClerkWage}) \end{array} \right) \end{array} \right)$$

Equation #6:

$$B_{Poll} = \begin{array}{c} Percent_{OVRS} \times Number_{Registrations} \\ \times Time_{GoodForms} \times Percent_{RegisterEDR} \times Cost_{PollWage} \end{array}$$

Equation #7:

$$B_{Reg} = \left(\begin{array}{c} \left(\begin{array}{c} Number_{TotalRegs} \times Percent_{OVRS} \\ \times Percent_{RegInPerson} \times Time_{TravelTime} \times Cost_{LeisureWage} \end{array} \right) \\ + \\ \left(\begin{array}{c} Number_{TotalRegs} \times Percent_{OVRS} \\ \times Percent_{RegByMail} \times (Cost_{stamp} + Cost_{paper\&ink}) \end{array} \right) \end{array} \right)$$

Equation #8:

$$B_{Scrap} = B_{Scrap}$$

DEFINITION OF VARIABLES

$\boldsymbol{C_{Implement}}$: Initial costs to implement OVRS, including hardware and personnel. This cost also includes the one-time retraining of election staff.

$\boldsymbol{C_{Maint}}$: Annual costs of maintaining the OVRS database, including hardware and personnel.

$\boldsymbol{C_{Adv}}$: Cost of advertising and educating voters on using OVRS for new and updated registrations.

$\boldsymbol{B_{processing}}$: Savings from processing OVRS registrations instead of status quo.

$\boldsymbol{B_{Clerk}}$: Savings from reduced Clerk labor.

$\boldsymbol{B_{Poll}}$: Savings from reduced Poll Worker labor.

$\boldsymbol{B_{Reg}}$: Savings for percent of voters that would have registered in person or by mail, using OVRS instead.

$\boldsymbol{B_{Scrap}}$: Scrap value of OVRS server hardware at end of 10 years.

Appendix B: Various Voter Registration Methods in Wisconsin

Since 1975, Wisconsin has allowed voters to register on Election Day at their polling place. As of August 2013, only eight other states plus the District of Columbia offer Election Day registration.[2] Voters may also update their information at the polling place by selecting the appropriate box on the registration form. Election Day registrants must provide proof of residence.[3] Proof of residence documents must include the voter's name and current address. Common acceptable forms include a current and valid WI driver's license or DOT-issued ID card, a photo employee ID card, school photo ID, dated utility bill within 90 days of election, or a bank statement.[4] Voters without a driver's license or other ID must provide the last four digits of their Social Security Number.[5]

In person, a voter can register at the clerk's office, by SRD (i.e. voter registration drives), or at the polling place on Election Day. Voters who register at the clerk's office or through an SRD during the open registration period do not have to provide proof of residence.[6] SRDs are trained by their municipalities to collect voter registration forms, and can only work in the municipality in which they were trained.

Voters can register by mail for the first time or update information by downloading and filling out WI Voter Registration Form, GAB-131, which can be found on the GAB's website or through the partial online system, My Vote Wisconsin. My Vote also allows voters to check the

[2] National Conference of State Legislatures (NCSL). 2013c. Same-Day Registration. Retrieved from: http://www.ncsl.org/research/elections-and-campaigns/same-day-registration.aspx.
[3] Government Accountability Board (GAB). 2012b. "Voter Registration Guides." Madison: GAB. http://gab.wi.gov/sites/default/files/publication/154/voter_registration_9_12_pdf_19989.pdf.
[4] Government Accountability Board (GAB). 2012a. "Proof of Residence Voter Registration." Madison: GAB. http://gab.wi.gov/sites/default/files/publication/154/proof_of_residence_for_voter_registration_9_12_pdf_17758.pdf
[5] GAB. 2012b.
[6] GAB. 2012b.

status of their registrations, view their voting history, and request an absentee ballot.[7] Users can fill out their voter registration application online; however, the finished forms must be printed, signed, and mailed to the clerk's office or brought to clerk in person.[8]

[7] Government Accountability Board (GAB). 2013a. Wisconsin Voter Information. Retrieved from: https://myvote.wi.gov/Home.aspx.
[8] GAB. 2012b.

Appendix C: Logistics of Implementing the OVRS

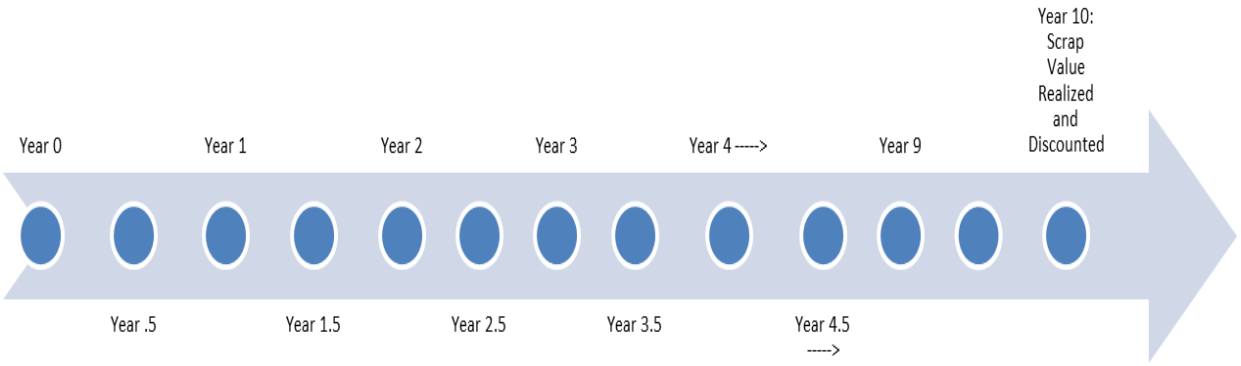
ASA 1 requires the GAB to modify its secure registration portal so that the existing interface on its website can be synchronized with DOT databases, allowing voters to complete a registration application electronically.[9] Two software programs must be developed to accomplish this: an OVRS module that provides real-time validation against DOT records and a module that places electronic signatures into the statewide voter registration database and onto the electronic voter registration application.[10] These programs allow the applicant's signature to be integrated with the voter application, validated with existing DOT records, and transmitted to the SVRS.[11] Under ASA 1, the GAB is tasked with creating and maintaining the OVRS website, while the DOT is tasked with creating a web service interface to interact with the GAB website.

[9] Government Accountability Board (GAB). 2013c. "GAB Fiscal Estimate: LRB 13-0058/1." Madison: GAB.
[10] GAB. 2013c.
[11] GAB. 2013c.

Appendix D: Implementation Timeframe

The GAB estimates the life cycle of this project would require one month project initiation and start-up; one month of analysis and requirements definition; one month of database design, application design, user interface definition, and data interchange design; one month of application development and system testing; two months of integration and user acceptance testing; and finally, two months of implementation, training and start-up break-fix.[12] In sum, GAB's best time estimate is that this would be a six month effort to complete the full design, development, testing, and implementation phases of the project.[13] The Department of Transportation estimates an implementation time of four months.

Figure 2 Implementation Costs Timeline



[12] GAB. 2013c.
[13] GAB. 2013c.

Appendix E: GAB Implementation Personnel Costs

Implementation Personnel Positions: Responsibilities and Wage Information

Based on the GAB's estimate, one Project Manager would be needed to oversee project activity and coordinate electronic interfaces with the DOT. This position would be funded during implementation on a full-time basis for 26 weeks at a blended rate of $100/hour (a wage estimated by the GAB that includes insurance and fringe benefits), for a total cost of $104,000.[14]

One Business Analyst would be needed to develop business requirements, the voter user interface, provide testing scripts, and define DOT/GAB data real-time interchange. This position would be funded during implementation on a full-time basis for 26 weeks at a blended rate of $85/hour, for a total cost of $88,400.[15]

One Solution Architect would be responsible for the overall design of the application of the OVRS and mapping business requirements to the new systems technical requirements. This position would be funded during implementation on a full-time basis for 26 weeks at a blended rate of $80/hour, for a total cost of $83,200.[16]

One Database Administrator would be needed to manage the data exchange, build new database tables and integrate new database elements into the SVRS. This position would be funded during implementation on a part-time basis (20 hours/week) for 26 weeks at a blended rate of $80/hour, for a total cost of $41,600.[17]

[14] GAB. 2013c.
[15] GAB. 2013c.
[16] GAB. 2013c.
[17] GAB. 2013c.

One Application Developer would be needed to assist with developing applications and testing the system. This position would be needed for 26 weeks on a part-time basis (10 hours/week) and paid a blended rate of $68/hour, for a cost of $17,680.[18]

One Infrastructure Support staff would be needed to manage the hardware, servers, network, and other infrastructure required to support the system. This 26-week position would be part time (10 hours/week) and compensated at a blended rate of $65, for a cost of $16,900.[19]

One Testing Lead would be needed to manage and coordinate testing of the OVRS. This position would be funded for nine weeks on a part-time basis (20 hours/week) at a blended rate of $35 an hour for a cost of $6,300.[20]

Table 2 Implementation Personnel Cost Summary

	Weeks funded	**Hours/Week**	**Blended Salary Rate**	**Total Implementation Cost**
Manager	26	40	$100	$104,000
Business Analyst	26	40	$85	$88,400
Solution Analyst	26	40	$80	$83,200
Database Administrator	26	20	$80	$41,600
Application Developer	26	10	$68	$17,680
Infrastructure Support	26	10	$65	$26,000
Testing Leads	9	20	$35	$6,300
Total Personnel Costs				**$367,180**

Source: Government Accountability Board

[18] GAB. 2013c.
[19] GAB. 2013c.
[20] GAB. 2013c.

Appendix F: GAB Implementation Hardware and Software Costs

The GAB believes it would need to purchase the following hardware in order to implement the system: three SQL database servers to manage the data, three Data Interchange Environments to manage the exchange between DOT and GAB, and one terabyte of memory to store the voter registration data and the electronic signatures.[21] These estimates use the market rates for the hardware devices as of April of 2013.

Table 3 Implementation Hardware and Software Costs

Infrastructure Device	Quantity to Purchase	Monthly Implementation Costs	Yearly Implementation Cost
SQL Servers (3)	3	$1515	$18,180
Data Interchange Environments	3	$561	$6,732
Storage (approximately $0.58/GB)	1024	$600	$7,200
Total Implementation Hardware and Software Costs			**$32,112**

Source: Government Accountability Board

[21] GAB. 2013c.

Appendix G: GAB Implementation Training Costs

Per the 2013 GAB fiscal estimate for OVRS, two Elections Specialists would be needed to conduct testing, further assist in developing training materials, and conduct training for election officials and voters. These positions would be funded for 17 weeks, on a part-time basis (20 hours/week), at a blended rate of $33 an hour for a total implementation cost of $22,440.[22]

The GAB's Training Coordinator has also estimated an additional forty hours of GAB staff time would be needed to prepare a webinar (lasting approximately two hours), update applicable manuals and the agency website, discuss the law change at clerk conferences, and post a memo to clerks outlining the these changes.[23]

Because this work would take employees away from their assigned tasks, we consider this an opportunity cost of implementing the OVRS. We assume all office material costs to be sunk. Training materials for clerks and their staff are created every year and GAB material costs to create these training documents are built into normal operating budgets. No additional materials would need to be purchased.

Table 4 GAB Implementation Training Costs

GAB Implementation Training Costs			
Staff	**Hours Needed**	**Hourly Rate**	**Total Cost**
GAB Staff	40 (One time)	$35	$1,400
Elections Specialists (2)	20 (per week for 17 weeks)	$33	$22,400
Total Training Costs			**$23,800**

Source: Government Accountability Board

[22] GAB. 2013c.
[23] GAB. 2013c.

Appendix H: GAB Public Advertising and Outreach Costs

Because of the breadth and complexity of the required changes to Wisconsin law if the OVRS is created, we believe a comprehensive public education campaign would be advisable. The public education campaign would focus on raising awareness about changes to the law through a variety of media channels, giving voters information about how to register to vote in advance of an election.[24] The goal of the public information campaign would be to direct voters to the registration website, where they can check their registration status, complete the registration process, or update their information if necessary.

The GAB could take advantage of a program by the Wisconsin Broadcasters Association that allows for paid public service announcement broadcasts on association radio and TV stations at a discounted cost per week.[25] Targeted print, outdoor, and online advertising would also need to be deployed. While our point estimate, based on previous GAB cost estimates, assumes that discounted rates could be procured, we allow for the possibility that this may not be the case. To get at cost variations, and fluctuations in market prices, we vary advertising costs by 5 percent in our Monte Carlo analysis.

Our advertising and public awareness cost point estimate for the OVRS is based on the GAB's estimate of multimedia campaigns for the implementation of Wisconsin's voter ID law.[26] The campaign for implementing the voter ID law would have cost approximately $638,900, which we discount over the first year of the OVRS project.

[24] Government Accountability Board (GAB). 2013b. "Final Report on the Impacts and Costs of Eliminating Election Day Registration in Wisconsin." Madison: GAB. http://gab.wi.gov/sites/default/files/publication/65/final_edr_report_02_18_2013_pdf_86368.pdf.
[25] GAB. 2013b.
[26] GAB. 2013b.

Appendix I: Annual GAB Personnel Costs

Facilitating online voter registration adds a new component to the SVRS that would require ongoing maintenance and support beyond the initial development.[27] GAB staff relied on similar past experiences in order to estimate the required resources, such as the development of the My Vote Wisconsin website. The GAB's predictions of ongoing costs based on this project are valid because of the similar size of both projects and the fact that this system is an expansion of the My Vote Wisconsin website.

The GAB estimates it would require five hours per week from one application developer, one database administrator, one infrastructure support, and one SVRS elections specialist at their original blended rate to maintain the OVRS system.[28] As this estimate is conservative (likely higher than the actual cost), we hold the salary of these positions constant. These costs would be incurred starting in the second year of the project, after implementation has occurred.

Table 5 Annual Personnel Cost Breakdown

Position	Weeks Worked Per Year	Hours/Week	Blended Salary Rate	Annual Salary Cost
Application Developer	52	5	$68	$17,680
Database Administrator	52	5	$80	$20,800
Infrastructure Support	52	5	$65	$16,900
SVRS Elections Specialist	52	5	$33	$8,580
Total Annual Personnel Cost				**$63,960**

Source: Government Accountability Board

[27] GAB. 2013c.
[28] GAB. 2013c.

Appendix J: Annual GAB Software Maintenance Costs

Subsequent maintenance costs are calculated using a conservative estimation based on the initial purchasing price. It assumes that the prices for all hardware and memory remain constant.

Table 6 GAB Software Maintenance Costs

Infrastructure Device	Quantity to Purchase	Monthly Implementation Costs	Yearly Implementation Cost
SQL Servers (3)	3	$1515.00	$18,180
Data Interchange Environments	3	$561.00	$6,732
Storage (approximately $0.58/GB)	1024	$600	$7,200
Total Annual Maintenance Costs			**$32,112**

Source: Government Accountability Board

Appendix K: DOT Implementation Costs

The DOT provided the GAB with an estimate of its total implementation costs for the OVRS outlined in ASA 1 to AB 225.[29] As the DOT has a good understanding of agency equipment, personnel, and implementation costs, we consider their estimates valid for use in this analysis. DOT software would have to be updated to provide a data representation of the voter's driver signature.

The DOT does not bear any costs other than those that would be incurred to allow the database synchronization. Consequently, all costs are one-time expenditures, as the DOT would not need additional funds or staff to maintain its part of the system. The database that would be synchronized with the GAB already exists and funds to continue database maintenance have been appropriated to the agency's budget. Thus, the DOT would bear no ongoing maintenance costs if the OVRS is created. The following information in this appendix is taken from the DOT's internal cost estimate from April 2013.[30]

Implementation Timeframe

The DOT estimates a total implementation time of four months, splitting the project time among a Project Lead, the DMV Core Unit Group, DMV CCS Unit, DA Unit, and Network Security Directory Services Unit Work.[31]

[29] Wisconsin Department of Transportation (DOT). 2013. "Fiscal Estimate of GAB online Voter/Driver Verification with Signature." Madison: DOT.
[30] DOT. 2013.
[31] DOT. 2013.

Explanation of Implementation Personnel Positions (Responsibilities and Wage Information)

The DOT estimates that 400 hours of Project Lead time would be required. The Project Lead would manage the project activity and coordinate electronic interfaces with GAB. This position would be funded at a blended wage rate of $85 per hour, for a total cost of $34,000.[32]

The DOT estimates that 200 hours of DMV Core Unit Work would be needed to provide impact analysis and testing of DMV systems, and consult on issues relating to access for the DMV systems. One Ca-Gen developer and one Mainframe Developer would be funded for 100 hours each. These positions would be funded at a blended wage rate of $85 per hour, for a total cost of $17,000.[33]

The DOT estimates that 640 hours of DMV CSS Unit Work would be needed to create the web service interface for a GAB-developed website that verifies voter registration information, compares the registration information with the DOT database, and returns the verified signature. One Tech Lead would be funded for one month (160 hours) and a senior Java developer would be funded for three months (480 hours). These positions would be funded at a blended rate of $85 per hour, for a total cost to fund the position during implementation of $54,400.[34]

The DOT estimates that 400 hours of DA Unit Work would be needed to develop and setup the system to validate and retrieve registrants' signatures from the previously used MorphoTrust software. This position would be funded at a blended wage rate of $85 per hour, for a total cost of $34,000.[35]

[32] DOT. 2013.
[33] DOT. 2013.
[34] DOT. 2013.
[35] DOT. 2013.

The DOT estimates that 20 hours of Network/Security/Director Service Unit time would be needed to review and resolve document and security concerns during implementation. This position would be funded at a blended rate of $85 per hour, for a total cost during implementation of $1,700.[36]

The DOT estimates that 24 hours of Server/Storage/Backup Unit Work would be needed to document the configuration of the WebSphere and related software. This position would be funded at a blended rate of $85 per hour, for a total cost during implementation of $2,040.[37]

Finally, 600 hours of application development work would be needed to finish implementation. This position would be funded at a blended wage rate of $16.25 an hour, for a total cost of $9,750.[38]

Table 7 Implementation Personnel Cost Breakdown Chart

Position	Hours Needed	Blended Wage	Total Implementation Cost
Project Lead	400	$85	$34,000
Ca-Gen Developer	100	$85	$8,500
Mainframe Developer	100	$85	$8,500
Tech Lead	160	$85	$13,600
Senior Java Developer	480	$85	$40,800
DA Unit	400	$85	$34,000
Network/Security/Directory Services Unit	20	$85	$1,700
Server/Storage/Backup Unit	24	$85	$2,040
Developer Costs	600	$16.25	$9,750
Total DOT Personnel Costs			**$152,890**

Source: Department of Transportation

[36] DOT. 2013.
[37] DOT. 2013.
[38] DOT. 2013.

Appendix L: Reduction in Paper and Ink Costs

The creation of a full OVRS would reduce the number of paper registrations and registration updates processed by municipal clerks, and subsequently, the amount of paper and ink needed to print registration forms. To measure these savings on an annual basis, we estimate an annual reduction in paper and multiply it by the per-sheet cost of paper and the amount of ink needed to print a single double-sided page with black ink. English registration forms are one page, double-sided (with registration information on the front and instructions printed on the back). We assume all forms are the same length, regardless of language.

To estimate the cost of a single sheet of paper we find the average cost of a ream of paper, determined by averaging the prices from ten online vendors, and divide it by the number of pages in a singular ream (500). This gives us a per page print cost of $0.05.

To determine the cost of the ink used to print a one-sided sheet, we use estimates in a report by Quality Logic from June of 2012.[39] To get a value of the cost of ink per page per cartridge, the analysis divides the per cartridge price of different brands of ink by the ink yield (in number of pages and photos). Taking the average of all the estimates yields a per page ink cost of $0.06 (rounded to the nearest whole cent). For a two-sided page, this would be $0.12. Summing the ink and paper values ($0.05 + $0.12), municipalities would save $0.17 per page for each piece of paper no longer needed under the new system.

[39] QualityLogic. 2012. "Cost of Ink Per Page Analysis United States." http://www.qualitylogic.com/tuneup/uploads/docfiles/QualityLogic-Cost-of-Ink-Per-Page-Analysis_US_May-2-2012.pdf.

Appendix M: Predicting OVRS Usage

Data

To predict future usage of the OVRS in Wisconsin, we use data from other states that have implemented online voter registration prior to the November 2012 general election. We make use of the EAC Election Administration and Voting Survey. The EAC uses the EAVS instrument to submit a required biennial report to Congress assessing the impact of the National Voter Registration Act (NVRA) on the administration of elections for Federal office during the preceding two-year period. In 2002, the HAVA transferred this responsibility from the Federal Election Commission (FEC) to the EAC.[40]

The EAVS includes state-by-state data on the number of voter registrations processed and the methods used to register.[41] The table below shows the percent of new registrants and those updating registration information for each state that adopted online voter registration and had useable data (only New York and Oregon were eliminated for this reason). Note that "year" refers to program year (i.e. Y7-8 indicates the number of registrations that occurred in the seventh and eighth year after an OVRS was implemented).

[40] United States Election Assistance Commission (EAC). 2013b. National Voter Registration Act Studies. Retrieved from: http://www.eac.gov/registration-data/.
[41] United States Election Assistance Commission (EAC). 2013a. Election Administration and Voting Survey. Retrieved from: http://www.eac.gov/research/election_administration_and_voting_survey.aspx.

Table 8 OVRS States' Registrations November 2008 - November 2012

State	Year	Number of Online Registrations	Total Registrations	Percent Online
CA	1	703,118	4,617,550	15.23
CO	1	624,975	3,910,236	16.44
IN	1	29,090	1,210,015	2.40
KS	1	24,158	360,835	6.70
LA	1	7,839	532,735	1.47
MD	1	134,323	1,989,784	6.75
NV	1	50,986	490,085	10.40
SC	1	17,040	1,426,202	1.19
UT	1	4,782	513,248	0.93
CO	2	237,577	1,031,638	23.03
IN	2	77,368	1,042,742	7.42
KS	2	24,158	360,835	6.70
LA	2	64,609	623,017	10.37
OR	2	100,598	400,213	25.14
UT	2	71,523	598,195	11.96
CO	3	237,577	1,031,638	23.03
IN	3	77,368	1,042,742	7.42
KS	3	32,244	307,573	10.48
LA	3	64,609	623,017	10.37
OR	3	100,598	400,213	25.14
UT	3	71,523	598,195	11.96
WA	3	54,711	363,193	15.06
KS	4	32,244	307,573	10.48
WA	4	54,711	363,193	15.06
WA	5	74,424	564,736	13.18
WA	6	74,424	564,736	13.18
AZ	7	217,860	893,152	24.39
AZ	8	217,860	893,152	24.39
AZ	9	479,540	973,386	49.27
AZ	10	479,540	973,386	49.27

Source: 2010 and 2012 NVRA Report Dataset

To capture earlier years of OVRS usage, we also collect data from a study funded by the Pew Center on the States that examined online voter registration uptake in Arizona and Washington (Table 9).

Table 9 Arizona Registrations for First Six Years of OVRS Usage

Years	Total Online Registrations	Total Registrations	Percentage Online
1-2	148,379	377,689	39.29
3-4	389,024	1,375,878	28.27
5-6	763,523	1,297,441	58.85

Source: Barreto et al., (2010). Online Voter Registration (OLVR) Systems in Arizona and Washington: Evaluating Usage, Public Confidence and Implementation Processes. Pew Center on the States.

Methodology

We compile the biennial EAC data and the PEW data from above. We run a statistical regression of the total OVRS registrations on year of service and year of service squared (see below). It should be noted that while the R^2 value indicates these variables explain approximately three-fourths of the variation in new registrations as a percentage of total registrations, none of these numbers are statistically significant. They serve merely as a way to estimate usage rates based on limited data from the few states with an OVRS in place, from biennial data points.

Figure 3 OVRS Registration Activity Regression Output

```
. reg p_online year year2
```

Source	SS	df	MS		
Model	.265957805	2	.132978903	Prob > F	0.0000
Residual	.138262567	27	.005120836	R-squared	0.6580
Total	.404220372	29	.013938634	Adj R-squared	0.6326
				Root MSE	.07156

Number of obs = 30
F(2, 27) = 25.97

p_online	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
year	-.0032503	.0207674	-0.16	0.877	-.0458615	.0393608
year2	.0041152	.0020671	1.99	0.057	-.0001262	.0083565
_cons	.0936407	.0370255	2.53	0.018	.0176707	.1696108

Results

Based on the available data on OVRS use in other states, we expect the following percentage of registrations to be completed using a new OVRS in Wisconsin. Note that the first year estimates are based on the current usage of Wisconsin's partial online voter registration system, My Vote Wisconsin. We allow usage rates to fluctuate plus or minus 7 percent, based on the root mean square error of our regression above.

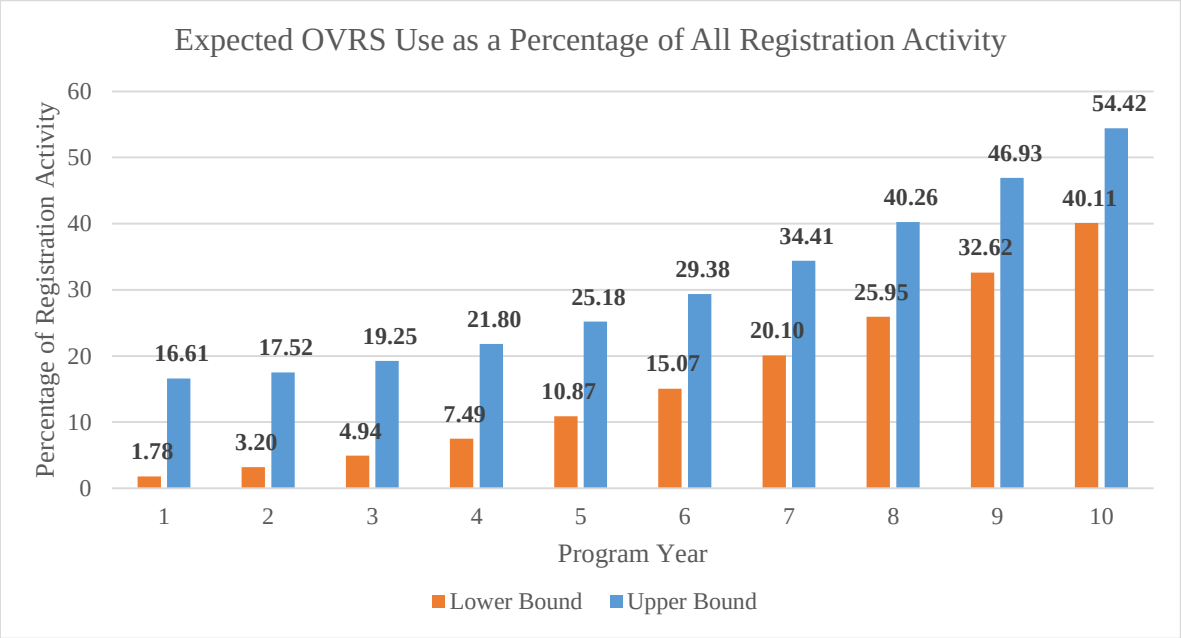
Table 10 Expected OVRS Use as a Percentage of All Registration Activity

Program Year	Year Coefficient	Year^2 Coefficient	Constant Coefficient	Percent OVRS Usage Value	Range: Low	Range: High
1*	(0.0033)	0.0041	0.0936	9.45	1.78	16.61
2	(0.0065)	0.0165	0.0936	10.36	3.20	17.52
3	(0.0098)	0.0370	0.0936	12.09	4.94	19.25
4	(0.0130)	0.0658	0.0936	14.65	7.49	21.80
5	(0.0163)	0.1029	0.0936	18.03	10.87	25.18
6	(0.0195)	0.1481	0.0936	22.23	15.07	29.38
7	(0.0228)	0.2016	0.0936	27.25	20.10	34.41
8	(0.0260)	0.2634	0.0936	33.10	25.95	40.26
9	(0.0293)	0.3333	0.0936	39.77	32.62	46.93
10	(0.0325)	0.4115	0.0936	47.27	40.11	54.42

*Year 1 usage estimates come from current My Vote Wisconsin usage rate

Source: Authors

Figure 4 Expected OVRS Use as a Percentage of All Registration Activity



Source: Authors

Appendix N: Calculating the Average Wage for Clerk Office Positions

To determine the average wage of a Wisconsin clerk, we analyze data from the October 2013 Wisconsin Municipal Clerks Association (WMCA) wage survey.[42] A total of 566 clerks answered the wage survey, 153 were denoted as full-time (assumed 40 per hour work week plus benefits), 410 were denoted part-time (assumed 20 per hour work week and no benefits), and three had no indication. Based on a weighted average to account for municipality population, we determine the average full-time wage plus benefits for a Wisconsin municipal clerk to be $31.28 per hour. We calculate benefits as 35 percent of full-time average hourly wage based on estimates from the Bureau of Labor Statistics.[43] We determine the average part-time wage for a Wisconsin municipal clerk to be $10.39 per hour. When weighted based on the percentage of full-time and part-time respondents to the WMCA survey, we calculate the municipal clerk hourly wage to be $19.32. The calculations are represented in the table below.

[42] Wisconsin Municipal Clerks Association (WMCA). 2013. Surveys. Retrieved from: http://wisclerks.org/resources/surveys/.
[43] United States Department of Labor. 2013. Employer Costs for Employee Compensation news release text. Retrieved from: http://www.bls.gov/news.release/ecec.nr0.htm.

Table 11 Weighted Average Annual Salary and Hourly Wages for Clerks, Including Benefits

Calculations for Weighted Average Salary for Full Time Clerk Staff, Including Benefits

FULL TIME Clerks	Average Annual Salary 2013	Salary and Benefits	Number of Municipalities Reported	Percentage	Average Salary * Percentage
Large	35,601	48,061	58	38	18,219
Medium	68,377	92,308	10	7	6,033
Small	54,413	73,457	85	56	40,810
			FT Weighted Average Annual Salary		**$65,062**

Calculations for Weighted Average Salary for Part Time Clerk Staff, No Benefits

PART TIME Clerks	Average Annual Salary (Hourly Wages) 2013	Salary and Benefits	Number of Municipalities Reported	Percentage	Average Salary * Percentage
Large	10,898	No benefits	391	95	10,393
Medium	NA	No benefits	0	-	NA
Small	8,854	No benefits	19	5	410
			PT Weighted Annual Average Salary (Wages)		**$10,803**

Calculations for Weighted Average Salary and Hourly Wage for All Clerk Staff

Staff Type	Number of Respondents	Percentage	Number of Hours	Annual Average Salary	Average Annual Salary * Percentage	Average Wage Per Hour
Full-time	153	27	2080	65,062	17,681	31
Part-time	410	73	1040	10,803	7,867	10
			Weighted Average Annual Salary/Hourly Wage		**$25,548**	**$19.32**

Source: WMCA and Authors

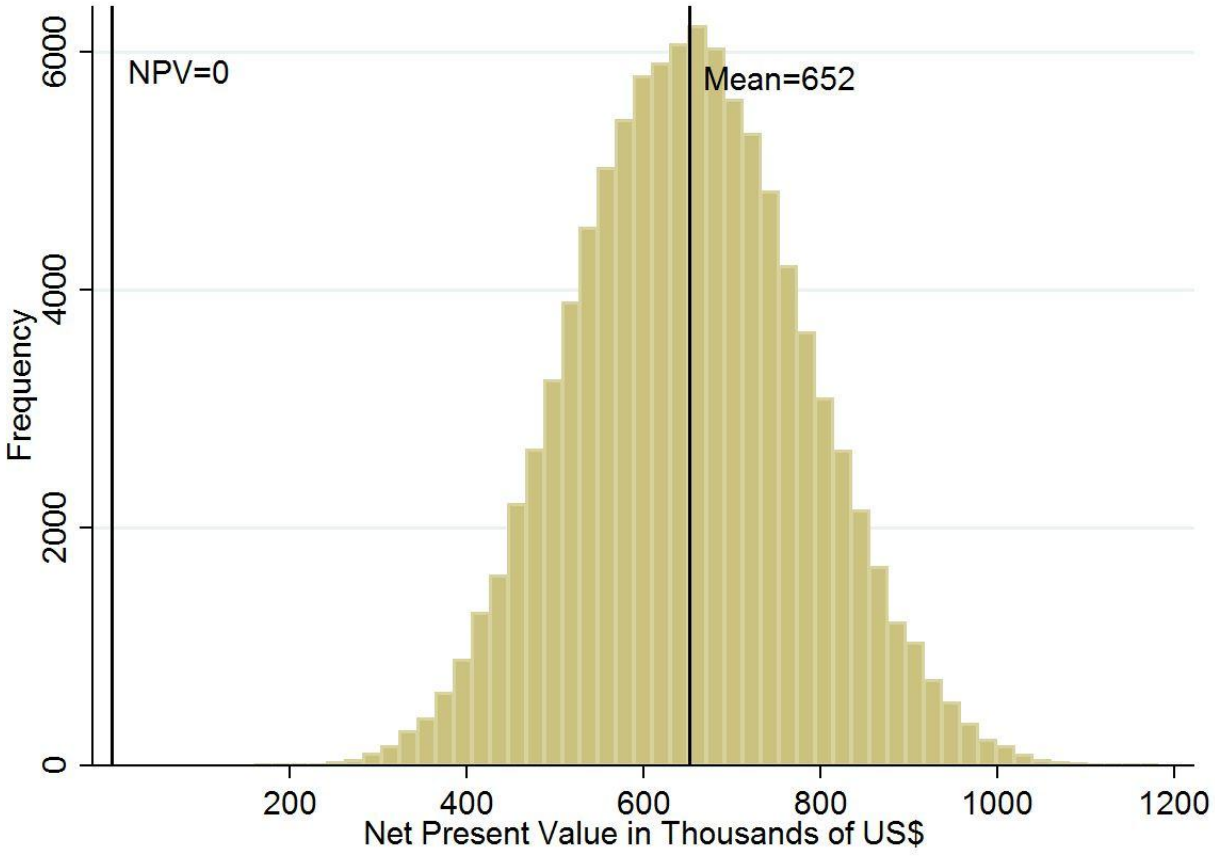
Appendix O: Zero Advertising Cost Scenarios

We interviewed election officials in seven states[44] that have implemented an OVRS. None of these states had any budgetary allocation for advertising the system. Instead, the states relied on free media, press releases, and information posted to their election information websites to inform the public. We explore three no-cost advertising scenarios and their effects on NPV.

Scenario One

If no advertising costs are incurred and the growth of OVRS usage is delayed by one year, net benefits would range from $160,700 to $1.2 million. Mean net benefits would equal approximately $652,000.

Figure 5 NPV of OVRS Implementation Under No Advertising Scenario 1



Source: Authors

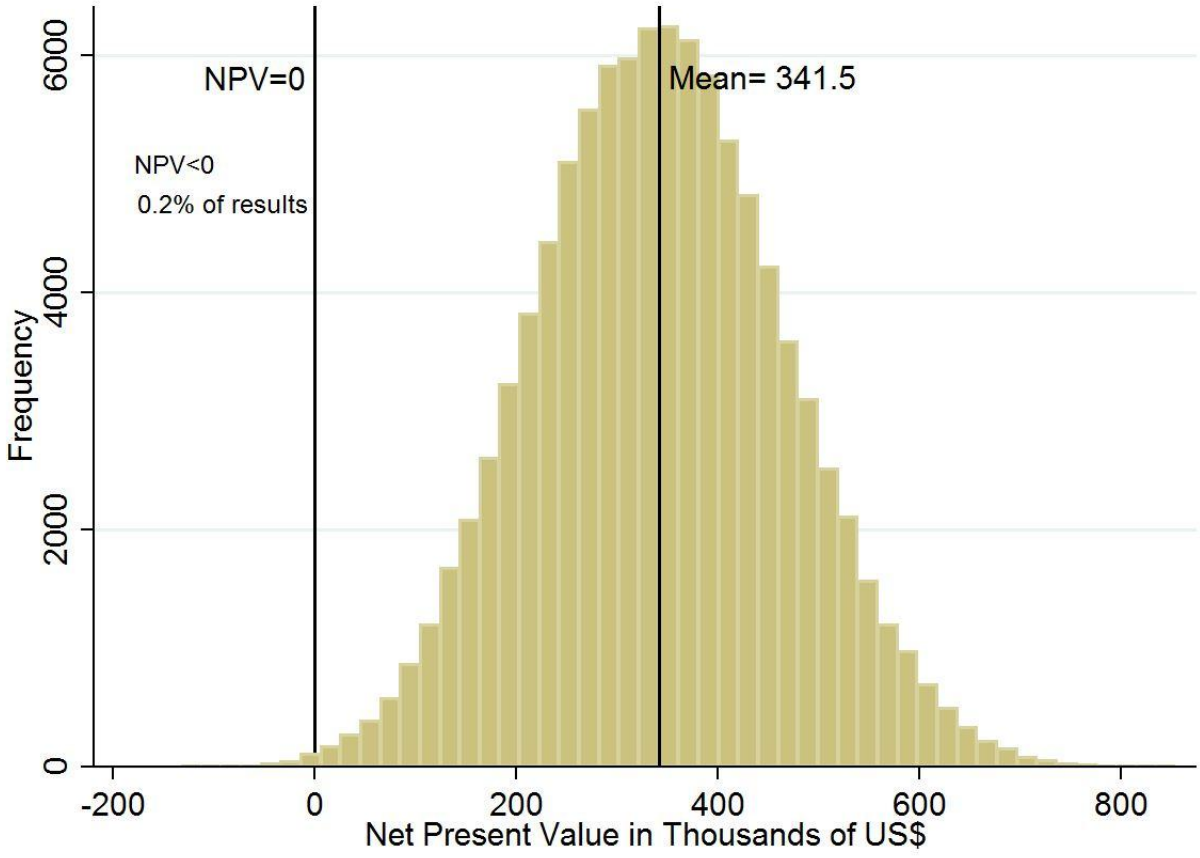
[44] Colorado, Kansas, Louisiana, Maryland, Utah, Oregon, and Washington

Scenario one provides a realistic prediction of OVRS usage rates should GAB decide not to advertise. It may be reasonable to assume that public awareness could be delayed up to one year while potential registrants learn about the system through free media, press releases, and the GAB website.

Scenario Two

If no advertising costs are incurred and the growth of OVRS usage is delayed by two years, net benefits would range from -$132,800 to $854,800. Mean net benefits would equal approximately $341,500.

Figure 6 NPV of OVRS Implementation Under No Advertising Scenario 2



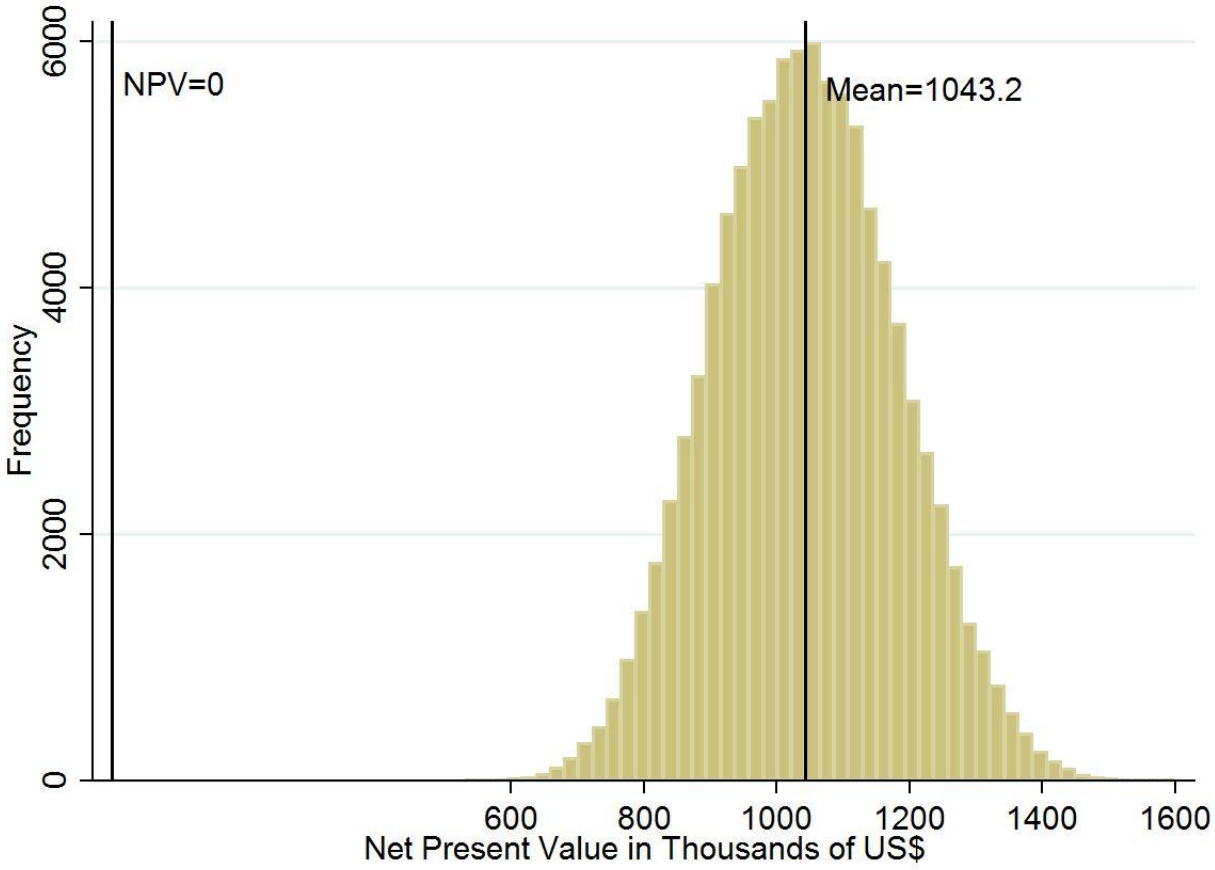
Source: Authors

Scenario two provides a more extreme OVRS growth rate delay due to no advertising. We believe that the vast majority of potential registrants would become aware of the OVRS in fewer than two years. However, we present this alternative due the occurrence of major elections every two years.

Scenario Three:

If no advertising costs are incurred, but OVRS usage remains at predicted levels, net benefits would range from $530,700 to $1.6 million. Mean net benefits would equal $1.04 million.

Figure 7 NPV of OVRS Implementation Under No Advertising Scenario 3



Source: Authors

We present scenario three with caution. Wisconsin residents rely heavily on EDR to register to vote or update their registrations, with 76 percent of registrants using this method. No other state that has implemented OVRS has EDR, making Wisconsin unique. Additionally, only 2 percent of registrants currently utilize the partial online registration system (My Vote Wisconsin), which could be due to the fact that many residents are unaware that it exists. While it may be possible to increase OVRS usage without advertising, we remain more confident in our analysis that recommends public outreach because of the concerns noted.

Appendix P: Reduction in Poll Workers Due to OVRS

If Wisconsin implemented the OVRS it would be the only state that also offers Election Day registration. Election Day registration is extremely popular with Wisconsin voters. The popularity of EDR requires clerks to ensure enough poll workers are available. We assume that a certain percentage of voters who currently register to vote or update their registrations on Election Day would instead use the OVRS, potentially reducing the demand for poll workers. Additionally, our survey to clerks gives us more confidence that an OVRS would reduce poll worker demand as 508 survey respondents expected a reduction of 112 poll worker positions should an OVRS be implemented (See Appendix S).

To calculate this reduction in demand, we assume that voters that traditionally use Election Day Registration (EDR) will switch to online registration at the same rate as our predicted OVRS usage (see Appendix M for OVRS usage, Appendix X for EDR rates, and Appendix R for annual registration rates). Based on the average time needed to process a voter registration, we assume the demand for poll workers will be reduced by 5 minutes for each registrant that switches from EDR to the OVRS (see Appendix S). The total time reduced is multiplied by the average poll worker wage to determine the final monetized savings of fewer poll workers hired.

Based on a review of 11 municipal clerk websites from around the state, we estimate that poll workers are paid $7.89 per hour. We further reduce this estimate to $7.25 to account for volunteer poll workers. This yields a cost savings from reduction in poll worker hours of approximately $361,800.

Table 12 Poll Worker Pay

Municipality	Wage (Per Hour)	Wage (Per Full Day)	Note	Source
Waukesha	7.50			http://www.ci.waukesha.wi.us
Kenosha	8.57	120.00		http://www.kenosha.org
Milwaukee	7.11	99.50	Includes $15 for training	http://city.milwaukee.gov
River Falls	8.50			http://www.rfcity.org
La Crosse	8.00			http://www.cityoflacrosse.org
Eau Claire	8.00			http://www.ci.eau-claire.wi.us
Beloit	8.57	120.00	Includes $10 for training	http://www.gouda.ci.beloit.wi.us
Prescott	7.57			http://www.prescottwi.org
Stoughton	7.50			http://www.ci.stoughton.wi.us
Sheboygan	7.14	100.00		http://www.ci.sheboygan.wi.us
Appleton	8.29	116.00		http://www.appleton.org
Average	**$ 7.89**	**$ 111.10**		

Source: Authors

Appendix Q: In-Person Registrations and Registrations by Mail

To calculate individual cost savings for those who would make use of the OVRS and no longer register by mail or in person at the clerk's office, we utilize of our estimate of OVRS usage (Appendix M) and registration percentages by mail and in-person, monetized travel time, and postage prices.

Registration Percentages

We first determine what percentage of registrations generally occurs via these two methods. Using data from the EAVS instrument, we determine that approximately 15 percent of all registrations in Wisconsin (new and updated) take place in person. This figure assumes all "in person" registrations occur at the clerk's office during the open registration period, so it does not account for any same-day registration that takes place during early voting (in-person absentee voting at the clerk's office). Based on the EAVS data, we estimate that approximately 3 percent of registrations take place via mail.

Travel Time and Leisure Wage

In order to determine the cost savings to individuals who would make use of the OVRS and no longer travel to the clerk's office during open registration, we examine time spent traveling and monetize travel time. Based on data from the United States Census Bureau, we substitute the average time travel to work, approximately 42 minutes roundtrip in Wisconsin, for the amount of time it would take the average Wisconsinite to travel to the clerk's office.[45] We take this as a blended mean of travel time to clerks' offices in rural and urban municipalities for all methods of transportation. We count this as "leisure time"[46] which is valued at half an

[45] United States Census Bureau. 2012. State & County QuickFacts: Wisconsin. Retrieved from: http://quickfacts.census.gov/qfd/states/55000.html.
[46] Anthony E. Boardman, David H. Greenberg, Aidan R. Vining, and David L. Weimer. 2010. *Cost-Benefit Analysis: Concepts and Practice*. 4th Edition. Boston: Prentice Hall.

individual's wage (including benefits) and monetized as such, yielding an hourly wage of $13.22.

Table 13 Leisure Wage Calculations

Base Salary	33,654
Social Security	5,150
401k/403b	1,279
Disability	236
Healthcare	6,507
Pension	2,154
Time-Off (32 days)**	6,028
Total Annual Salary and Benefits	55,008
Hourly Wage and Benefits	26.45
Leisure Wage (Per Hour)	**$13.22**

**Paid Time-Off Calculation

Pre-Time Off Total	48,980
Full Time Hours (Per Year)	2,080
Wage and Benefits (Per Hour)[47]	23.55
Work Hours in 32 Days	256
Value of Paid Time-Off	**$6,028**

Source: Salary.com and Authors

Cost of Postage

In order to determine the cost savings to individuals who would make use of the OVRS and no longer submit their registration forms by mail, we calculate the cost of postage for the life of the project. Using historical data on stamp prices from the United States Postal Service[48] and

[47] Pre-Paid Time Off

[48] United States Postal Service. 2013. "Rates for Domestic Letters Since 1863." http://about.usps.com/who-we-are/postal-history/domestic-letter-rates-since-1863.pdf

an inflation calculator from the Bureau of Labor and Statistics,[49] we determine that the real price of a stamp has consistently been approximately $0.50, and expect this trend to continue.

Table 14 Historical Postage Prices

Year	Nominal Postage price	Real Postage Price ($2013)	Percent Change in Real Price	Year	Nominal Postage price	Real Postage Price ($2013)	Percent Change in Real Price
1981	0.19	0.49	14.0	1998	0.32	0.46	-2.1
1982	0.20	0.49	0.0	1999	0.33	0.46	0.0
1983	0.20	0.47	-4.1	2000	0.33	0.45	-2.2
1984	0.20	0.45	-4.3	2001	0.34	0.45	0.0
1985	0.22	0.48	6.7	2002	0.37	0.48	6.7
1986	0.22	0.47	-2.1	2003	0.37	0.47	-2.1
1987	0.22	0.45	-4.3	2004	0.37	0.46	-2.1
1988	0.25	0.49	8.9	2005	0.37	0.44	-4.3
1989	0.25	0.47	-4.1	2006	0.39	0.45	2.3
1990	0.25	0.45	-4.3	2007	0.41	0.46	2.2
1991	0.29	0.50	11.1	2008	0.42	0.46	0.0
1992	0.29	0.48	-4.0	2009	0.44	0.48	4.3
1993	0.29	0.47	-2.1	2010	0.44	0.47	-2.1
1994	0.29	0.46	-2.1	2011	0.44	0.46	-2.1
1995	0.32	0.49	6.5	2012	0.45	0.46	0.0
1996	0.32	0.48	-2.0	2013	0.46	0.46	0.0
1997	0.32	0.47	-2.1	2014	0.49		

Sources: USPS and authors.

[49] United States Bureau of Labor and Statistics. 2013. CPI Inflation Calculator. Retrieved from: http://www.bls.gov/data/inflation_calculator.htm

Appendix R: Total Annual Voter Registrations in Wisconsin

We estimate the total number of voter registrations processed per year in Wisconsin based on historical registration data and estimates from the GAB. As the upper bound of our estimation we use the GAB's fiscal estimate of LRB 13-0058/1, which states that an average of 397,179 registrations will be processed annually in Wisconsin.[50] Our lower bound is based on GAB registration statistics dating back to 2008. To account for the surges in registrations for the last two presidential elections compared to previous years, we include a lower range of 350,000 registrations per year for added conservatism in the model.

[50] GAB. 2013c.

Appendix S: Surveying Municipal and County Clerks

We sent a survey to municipal clerks and all county clerks to gain a better understanding of how an OVRS would affect clerks across the state. The survey was administered by GAB and was conducted from October 18, 2013 to November 4, 2013. The survey asked clerks to estimate the time it takes to process a registration form, the time it takes to process an illegible or inaccurate registration form, and the percentage of registration forms received that are illegible or inaccurate and predict any reduction in staff or reduction in poll workers hired due to the OVRS. Clerks responded to each question to a varying degree. Below we provide a summary of responses to each survey question. For an explanation of municipality size please see Appendix Y.

Question 1. If online voter registration were implemented, how many full-time equivalent staff positions would you anticipate reducing?

Clerks were asked to choose between reducing 0 to 5 FTE staff positions and were allowed to fill in a number greater than 5 if they desired. A total of 490 clerks responded to the question. This response number includes clerks who commented that they would likely not reduce any positions. In total, clerks reported that 20 FTE positions would be reduced.

Question 2. If online voter registration were implemented, would you anticipate reducing the number of poll workers employed (such as those who assist with voter registration on Election Day)? If so, by how many?

A total of 508 clerks responded to the question, reporting that a total of 112 poll worker positions would be reduced.

Question 3. On average, how many minutes does it take to process a legible and accurate voter registration form during the 60 days leading up to a fall general election?

A total of 522 clerks responded to the question. Based on the responses, clerks spend an average of 5.61 minutes processing a legible and accurate registration form.

Question 4. On average, how many minutes does it take to resolve and process an illegible or inaccurate registration form?

A total of 506 clerks responded to the question. Based on the responses, clerks spend an average of 8.45 minutes processing an illegible or inaccurate registration form.

What percentage of registration forms processed are illegible or inaccurate?

A total of 513 clerks responded to the question. Based on the responses, 8.95 percent of all registration forms are illegible or inaccurate.

Table 15 Summary of Clerk Survey Responses

Municipality Size	Process Time (minutes) for Registrations Without Problems	Process Time (minutes) for Registrations With Problems	Percent of Registration Forms With Problems	FTE Clerk Staff Reduction	Sum of OVRS Poll Worker Reduction Numbers
Large	3.00	5.00	17.50	0	0
Medium	3.75	6.83	10.92	0	2
Small	5.67	8.50	8.87	20	110
Total	**5.61**	**8.45**	**8.95**	**20**	**112**

Appendix T: Excel Sheet Version of Monte Carlo Analysis

We have provided GAB with an Excel spreadsheet that recreates our STATA Monte Carlo analysis. This spreadsheet allows for the adjustment of variable values and ranges to calculate net present benefits. Due to Excel's limited resources, this spreadsheet runs only 1,000 Monte Carlo calculations.

Appendix U: STATA Do File

```
clear

set seed 59595
set obs 100000

*/Variables*/

gen N_TotRegs= 397179+(350000-397179)*runiform()

gen C_ClerkWage = 19.32
gen C_paper_ink = 0.17
gen C_PollWage = 7.25
gen C_LeisureWage= 13.22
gen C_Stamp = 0.5

gen P_RegByMail=0.03
gen P_RegInPerson=.11
gen p_RegEDR= 0.76
gen P_IncForms=0.09

gen T_Travel= 42
gen T_OkForms= 5.6111
gen T_IncForms= 8.4503

*/Rate*/

gen rate=0.035

*/Percent Total OVRS Use +/- OVRS Root MSE 0.07156. Yr1 lower bound is
current MyVoteWI usage*/

gen TotOVRS_Y1 =0.166066+(0.017800-0.166066)*(runiform()+runiform())/2
gen TotOVRS_Y2 =0.175161+(0.032041-0.175161)*(runiform()+runiform())/2
gen TotOVRS_Y3 =0.192487+(0.049367-0.192487)*(runiform()+runiform())/2
gen TotOVRS_Y4 =0.218043+(0.074923-0.218043)*(runiform()+runiform())/2
gen TotOVRS_Y5 =0.251829+(0.108709-0.251829)*(runiform()+runiform())/2
gen TotOVRS_Y6 =0.293846+(0.150726-0.293846)*(runiform()+runiform())/2
gen TotOVRS_Y7 =0.344093+(0.200973-0.344093)*(runiform()+runiform())/2
gen TotOVRS_Y8 =0.402571+(0.259451-0.402571)*(runiform()+runiform())/2
gen TotOVRS_Y9 =0.469279+(0.326159-0.469279)*(runiform()+runiform())/2
gen TotOVRS_Y10=0.544218+(0.401098-0.544218)*(runiform()+runiform())/2

*/Costs:*/

*/Cost of Implementation*/

gen C_Implement= 604781.1+(547183-604781.1)*runiform()

*/Cost of Maintenance*/

gen C_Maint= 100876+(91268-100876)*runiform()

*/Cost of Advertising: Years 1 and 2 only*/
```

```
gen C_Adv1= 682500+(617500-682500)*runiform()
gen C_Adv2= 0+(0-0)*runiform()

*/Benefits*/

*/Local Government Processing Savings: paper and ink*/

gen B_process_Y1 =N_TotRegs* TotOVRS_Y1* C_paper_ink*P_RegInPerson
gen B_process_Y2 =N_TotRegs* TotOVRS_Y2* C_paper_ink*P_RegInPerson
gen B_process_Y3 =N_TotRegs* TotOVRS_Y3* C_paper_ink*P_RegInPerson
gen B_process_Y4 =N_TotRegs* TotOVRS_Y4* C_paper_ink*P_RegInPerson
gen B_process_Y5 =N_TotRegs* TotOVRS_Y5* C_paper_ink*P_RegInPerson
gen B_process_Y6 =N_TotRegs* TotOVRS_Y6* C_paper_ink*P_RegInPerson
gen B_process_Y7 =N_TotRegs* TotOVRS_Y7* C_paper_ink*P_RegInPerson
gen B_process_Y8 =N_TotRegs* TotOVRS_Y8* C_paper_ink*P_RegInPerson
gen B_process_Y9 =N_TotRegs* TotOVRS_Y9* C_paper_ink*P_RegInPerson
gen B_process_Y10 =N_TotRegs*TotOVRS_Y10*C_paper_ink*P_RegInPerson

*/Savings from Reduced Clerk Labor*/

gen S_ClerkTime_np_Y1 =TotOVRS_Y1* N_TotRegs* T_OkForms* (1-P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_np_Y2 =TotOVRS_Y2* N_TotRegs* T_OkForms* (1-P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_np_Y3 =TotOVRS_Y3* N_TotRegs* T_OkForms* (1-P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_np_Y4 =TotOVRS_Y4* N_TotRegs* T_OkForms* (1-P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_np_Y5 =TotOVRS_Y5* N_TotRegs* T_OkForms* (1-P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_np_Y6 =TotOVRS_Y6* N_TotRegs* T_OkForms* (1-P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_np_Y7 =TotOVRS_Y7* N_TotRegs* T_OkForms* (1-P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_np_Y8 =TotOVRS_Y8* N_TotRegs* T_OkForms* (1-P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_np_Y9 =TotOVRS_Y9* N_TotRegs* T_OkForms* (1-P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_np_Y10 =TotOVRS_Y10* N_TotRegs* T_OkForms* (1-
P_IncForms)/60*C_ClerkWage

gen S_ClerkTime_prob_Y1 =TotOVRS_Y1* N_TotRegs* T_IncForms* (P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_prob_Y2 =TotOVRS_Y2* N_TotRegs* T_IncForms* (P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_prob_Y3 =TotOVRS_Y3* N_TotRegs* T_IncForms* (P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_prob_Y4 =TotOVRS_Y4* N_TotRegs* T_IncForms* (P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_prob_Y5 =TotOVRS_Y5* N_TotRegs* T_IncForms* (P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_prob_Y6 =TotOVRS_Y6* N_TotRegs* T_IncForms* (P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_prob_Y7 =TotOVRS_Y7* N_TotRegs* T_IncForms* (P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_prob_Y8 =TotOVRS_Y8* N_TotRegs* T_IncForms* (P_IncForms)/ 60*
C_ClerkWage
```

```
gen S_ClerkTime_prob_Y9 =TotOVRS_Y9* N_TotRegs* T_IncForms* (P_IncForms)/ 60*
C_ClerkWage
gen S_ClerkTime_prob_Y10 =TotOVRS_Y10* N_TotRegs* T_IncForms*
(P_IncForms)/60*C_ClerkWage

gen B_ClerkLabor_Y1= S_ClerkTime_np_Y1+ S_ClerkTime_prob_Y1
gen B_ClerkLabor_Y2= S_ClerkTime_np_Y2+ S_ClerkTime_prob_Y2
gen B_ClerkLabor_Y3= S_ClerkTime_np_Y3+ S_ClerkTime_prob_Y3
gen B_ClerkLabor_Y4= S_ClerkTime_np_Y4+ S_ClerkTime_prob_Y4
gen B_ClerkLabor_Y5= S_ClerkTime_np_Y5+ S_ClerkTime_prob_Y5
gen B_ClerkLabor_Y6= S_ClerkTime_np_Y6+ S_ClerkTime_prob_Y6
gen B_ClerkLabor_Y7= S_ClerkTime_np_Y7+ S_ClerkTime_prob_Y7
gen B_ClerkLabor_Y8= S_ClerkTime_np_Y8+ S_ClerkTime_prob_Y8
gen B_ClerkLabor_Y9= S_ClerkTime_np_Y9+ S_ClerkTime_prob_Y9
gen B_ClerkLabor_Y10=S_ClerkTime_np_Y10+S_ClerkTime_prob_Y10

*/Savings from Reduced Poll Labor*/

gen B_PollLabor_Y1= TotOVRS_Y1* N_TotRegs* T_OkForms* p_RegEDR/ 60*
C_PollWage
gen B_PollLabor_Y2= TotOVRS_Y2* N_TotRegs* T_OkForms* p_RegEDR/ 60*
C_PollWage
gen B_PollLabor_Y3= TotOVRS_Y3* N_TotRegs* T_OkForms* p_RegEDR/ 60*
C_PollWage
gen B_PollLabor_Y4= TotOVRS_Y4* N_TotRegs* T_OkForms* p_RegEDR/ 60*
C_PollWage
gen B_PollLabor_Y5= TotOVRS_Y5* N_TotRegs* T_OkForms* p_RegEDR/ 60*
C_PollWage
gen B_PollLabor_Y6= TotOVRS_Y6* N_TotRegs* T_OkForms* p_RegEDR/ 60*
C_PollWage
gen B_PollLabor_Y7= TotOVRS_Y7* N_TotRegs* T_OkForms* p_RegEDR/ 60*
C_PollWage
gen B_PollLabor_Y8= TotOVRS_Y8* N_TotRegs* T_OkForms* p_RegEDR/ 60*
C_PollWage
gen B_PollLabor_Y9= TotOVRS_Y9* N_TotRegs* T_OkForms* p_RegEDR/ 60*
C_PollWage
gen B_PollLabor_Y10= TotOVRS_Y10* N_TotRegs*T_OkForms* p_RegEDR/60*
C_PollWage

*/Savings from Reduced Costs to Register*/

gen S_InPers_Y1= N_TotRegs* TotOVRS_Y1* P_RegInPerson*
T_Travel*C_LeisureWage/60
gen S_InPers_Y2= N_TotRegs* TotOVRS_Y2* P_RegInPerson*
T_Travel*C_LeisureWage/60
gen S_InPers_Y3= N_TotRegs* TotOVRS_Y3* P_RegInPerson*
T_Travel*C_LeisureWage/60
gen S_InPers_Y4= N_TotRegs* TotOVRS_Y4* P_RegInPerson*
T_Travel*C_LeisureWage/60
gen S_InPers_Y5= N_TotRegs* TotOVRS_Y5* P_RegInPerson*
T_Travel*C_LeisureWage/60
gen S_InPers_Y6= N_TotRegs* TotOVRS_Y6* P_RegInPerson*
T_Travel*C_LeisureWage/60
gen S_InPers_Y7= N_TotRegs* TotOVRS_Y7* P_RegInPerson*
T_Travel*C_LeisureWage/60
gen S_InPers_Y8= N_TotRegs* TotOVRS_Y8* P_RegInPerson*
T_Travel*C_LeisureWage/60
```

```
gen S_InPers_Y9= N_TotRegs* TotOVRS_Y9* P_RegInPerson*
T_Travel*C_LeisureWage/60
gen S_InPers_Y10=N_TotRegs* TotOVRS_Y10*P_RegInPerson*
T_Travel*C_LeisureWage/60

gen S_ByMail_Y1= N_TotRegs* TotOVRS_Y1* P_RegByMail*(C_paper_ink+ C_Stamp)
gen S_ByMail_Y2= N_TotRegs* TotOVRS_Y2* P_RegByMail*(C_paper_ink+ C_Stamp)
gen S_ByMail_Y3= N_TotRegs* TotOVRS_Y3* P_RegByMail*(C_paper_ink+ C_Stamp)
gen S_ByMail_Y4= N_TotRegs* TotOVRS_Y4* P_RegByMail*(C_paper_ink+ C_Stamp)
gen S_ByMail_Y5= N_TotRegs* TotOVRS_Y5* P_RegByMail*(C_paper_ink+ C_Stamp)
gen S_ByMail_Y6= N_TotRegs* TotOVRS_Y6* P_RegByMail*(C_paper_ink+ C_Stamp)
gen S_ByMail_Y7= N_TotRegs* TotOVRS_Y7* P_RegByMail*(C_paper_ink+ C_Stamp)
gen S_ByMail_Y8= N_TotRegs* TotOVRS_Y8* P_RegByMail*(C_paper_ink+ C_Stamp)
gen S_ByMail_Y9= N_TotRegs* TotOVRS_Y9* P_RegByMail*(C_paper_ink+ C_Stamp)
gen S_ByMail_Y10=N_TotRegs* TotOVRS_Y10*P_RegByMail*(C_paper_ink+ C_Stamp)

gen B_Reg_Y1= S_InPers_Y1+ S_ByMail_Y1
gen B_Reg_Y2= S_InPers_Y2+ S_ByMail_Y2
gen B_Reg_Y3= S_InPers_Y3+ S_ByMail_Y3
gen B_Reg_Y4= S_InPers_Y4+ S_ByMail_Y4
gen B_Reg_Y5= S_InPers_Y5+ S_ByMail_Y5
gen B_Reg_Y6= S_InPers_Y6+ S_ByMail_Y6
gen B_Reg_Y7= S_InPers_Y7+ S_ByMail_Y7
gen B_Reg_Y8= S_InPers_Y8+ S_ByMail_Y8
gen B_Reg_Y9= S_InPers_Y9+ S_ByMail_Y9
gen B_Reg_Y10=S_InPers_Y10+S_ByMail_Y10

*/Benefit from OVRS Hardware Scrap Value*/

gen B_scrap=3899+(400-3899)*runiform()

*/Generate Net Benefits Year 1-10*/

gen NetBen_Y0= -C_Implement
gen NetBen_Y1= (-C_Maint- C_Adv1+ B_process_Y1+ B_ClerkLabor_Y1+
B_PollLabor_Y1+ B_Reg_Y1)/(1+rate)^0.5
gen NetBen_Y2= (-C_Maint- C_Adv2+ B_process_Y2+ B_ClerkLabor_Y2+
B_PollLabor_Y2+ B_Reg_Y2)/ (1+rate)^1.5
gen NetBen_Y3= (-C_Maint+ B_process_Y3+ B_ClerkLabor_Y3+ B_PollLabor_Y3+
B_Reg_Y3)/ (1+rate)^2.5
gen NetBen_Y4= (-C_Maint+ B_process_Y4+ B_ClerkLabor_Y4+ B_PollLabor_Y4+
B_Reg_Y4)/ (1+rate)^3.5
gen NetBen_Y5= (-C_Maint+ B_process_Y5+ B_ClerkLabor_Y5+ B_PollLabor_Y5+
B_Reg_Y5)/ (1+rate)^4.5
gen NetBen_Y6= (-C_Maint+ B_process_Y6+ B_ClerkLabor_Y6+ B_PollLabor_Y6+
B_Reg_Y6)/ (1+rate)^5.5
gen NetBen_Y7= (-C_Maint+ B_process_Y7+ B_ClerkLabor_Y7+ B_PollLabor_Y7+
B_Reg_Y7)/ (1+rate)^6.5
gen NetBen_Y8= (-C_Maint+ B_process_Y8+ B_ClerkLabor_Y8+ B_PollLabor_Y8+
B_Reg_Y8)/ (1+rate)^7.5
gen NetBen_Y9= (-C_Maint+ B_process_Y9+ B_ClerkLabor_Y9+ B_PollLabor_Y9+
B_Reg_Y9)/ (1+rate)^8.5
gen NetBen_Y10=(-C_Maint+
B_process_Y10+B_ClerkLabor_Y10+B_PollLabor_Y10+B_Reg_Y10)/(1+rate)^9.5
gen NetBen_Y10E= B_scrap/(1+rate)^10

*/Generate Net Present Value*/
```

```
gen NPV= NetBen_Y0+ NetBen_Y1 +NetBen_Y2+ NetBen_Y3+ NetBen_Y4+ NetBen_Y5+
NetBen_Y6+ NetBen_Y7+ NetBen_Y8+ NetBen_Y9+ NetBen_Y10+ NetBen_Y10E

gen NPV_k= NPV/1000

*/Generate NPV Histogram*/

histogram NPV_k, frequency

sum NPV
sum NPV_k

ttest NPV_k == 0
ttest NPV_k == 0, level(99.9)

count if NPV_k<0
count if NPV_k>=0
```

Appendix V: STATA Variable Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
N_TotRegs	100000	373598.9	13628.68	350000.2	397178.5
C_ClerkWage	100000	19.32	0	19.32	19.32
C_paper_ink	100000	.17	0	.17	.17
C_PollWage	100000	7.25	0	7.25	7.25
C_LeisureW~e	100000	13.22	0	13.22	13.22
C_Stamp	100000	.5	0	.5	.5
P_RegByMail	100000	.03	0	.03	.03
P_RegInPer~n	100000	.11	0	.11	.11
p_RegEDR	100000	.76	0	.76	.76
P_IncForms	100000	.09	0	.09	.09
T_Travel	100000	42	0	42	42
T_OkForms	100000	5.6111	0	5.6111	5.6111
T_IncForms	100000	8.4503	0	8.4503	8.4503
rate	100000	.035	0	.035	.035
TotOVRS_Y1	100000	.0919997	.030209	.0181	.1654866
TotOVRS_Y2	100000	.1037267	.029291	.0322479	.1746259
TotOVRS_Y3	100000	.1210819	.0292279	.0496582	.1920991
TotOVRS_Y4	100000	.1464366	.02927	.0752575	.2178911
TotOVRS_Y5	100000	.1802841	.0292115	.109003	.2516977
TotOVRS_Y6	100000	.2221354	.0292181	.1508303	.2932472
TotOVRS_Y7	100000	.2724874	.0292204	.2013027	.3439682
TotOVRS_Y8	100000	.331073	.029237	.2596157	.4024023
TotOVRS_Y9	100000	.3977418	.0293133	.3262851	.4691462
TotOVRS_Y10	100000	.4728018	.0291837	.4015038	.5439095
C_Implement	100000	576008.8	16607.31	547183.8	604781.1
C_Maint	100000	96072.56	2768.251	91268.01	100875.8
C_Adv1	100000	650029.2	18748.99	617500.4	682499.2
C_Adv2	100000	0	0	0	0
B_process_Y1	100000	642.7069	212.3412	122.9249	1220.994
B_process_Y2	100000	724.6755	206.5378	215.9367	1283.907
B_process_Y3	100000	845.8843	206.5512	326.8611	1422.572
B_process_Y4	100000	1023.038	207.9659	495.8271	1598.515
B_process_Y5	100000	1259.506	209.2103	727.742	1856.626
B_process_Y6	100000	1551.894	211.8642	997.8876	2174.713
B_process_Y7	100000	1903.681	215.764	1325.927	2536.884
B_process_Y8	100000	2312.957	220.924	1702.625	2976.179
B_process_Y9	100000	2778.732	228.5001	2152.382	3475.721
B_process~10	100000	3303.132	236.9096	2639.909	4025.298
S_Clerk~p_Y1	100000	56508.87	18669.72	10807.95	107353.8
S_Clerk~p_Y2	100000	63715.82	18159.47	18985.85	112885.2
S_Clerk~p_Y3	100000	74372.89	18160.65	28738.68	125077.2
S_Clerk~p_Y4	100000	89948.79	18285.04	43594.73	140546.6
S_Clerk~p_Y5	100000	110739.8	18394.45	63985.43	163240.6
S_Clerk~p_Y6	100000	136447.6	18627.79	87737.51	191207.8

S_Clerk~p_Y7	100000	167377.8	18970.67	116579.8	223051
S_Clerk~p_Y8	100000	203362.7	19424.35	149700.3	261675.3
S_Clerk~p_Y9	100000	244315.1	20090.47	189244.4	305596.7
S_Cler~p_Y10	100000	290422.1	20829.86	232109.3	353917.2
S_Clerk~b_Y1	100000	8416.701	2780.757	1609.788	15989.78
S_Clerk~b_Y2	100000	9490.138	2704.759	2827.843	16813.66
S_Clerk~b_Y3	100000	11077.45	2704.933	4280.477	18629.59
S_Clerk~b_Y4	100000	13397.4	2723.46	6493.206	20933.68
S_Clerk~b_Y5	100000	16494.12	2739.757	9530.295	24313.83
S_Clerk~b_Y6	100000	20323.15	2774.511	13068.04	28479.4
S_Clerk~b_Y7	100000	24930.05	2825.582	17363.95	33222.29
S_Clerk~b_Y8	100000	30289.81	2893.155	22297.07	38975.17
S_Clerk~b_Y9	100000	36389.46	2992.37	28186.96	45517.02
S_Cler~b_Y10	100000	43256.85	3102.498	34571.47	52714.11
B_ClerkLab~1	100000	64925.57	21450.48	12417.74	123343.6
B_ClerkLab~2	100000	73205.95	20864.23	21813.7	129698.9
B_ClerkLab~3	100000	85450.34	20865.58	33019.16	143706.8
B_ClerkLab~4	100000	103346.2	21008.5	50087.93	161480.3
B_ClerkLab~5	100000	127233.9	21134.21	73515.73	187554.4
B_ClerkLab~6	100000	156770.7	21402.3	100805.5	219687.2
B_ClerkLab~7	100000	192307.9	21796.26	133943.7	256273.3
B_ClerkLab~8	100000	233652.5	22317.5	171997.4	300650.5
B_ClerkLab~9	100000	280704.6	23082.84	217431.3	351113.7
B_ClerkLa~10	100000	333678.9	23932.35	266680.8	406631.3
B_PollLabo~1	100000	17710.05	5851.146	3387.245	33644.99
B_PollLabo~2	100000	19968.73	5691.233	5950.222	35378.57
B_PollLabo~3	100000	23308.68	5691.601	9006.788	39199.55
B_PollLabo~4	100000	28190.22	5730.584	13662.72	44047.73
B_PollLabo~5	100000	34706.19	5764.875	20053.22	51160.08
B_PollLabo~6	100000	42763.07	5838.003	27497.2	59925.09
B_PollLabo~7	100000	52456.7	5945.465	36536.45	69904.85
B_PollLabo~8	100000	63734.46	6087.648	46916.51	82009.81
B_PollLabo~9	100000	76569.08	6296.412	59309.74	95774.9
B_PollLab~10	100000	91019.13	6528.138	72743.75	110918.7
S_InPers_Y1	100000	34985.94	11558.85	6691.452	66465.19
S_InPers_Y2	100000	39447.92	11242.95	11754.58	69889.84
S_InPers_Y3	100000	46045.96	11243.67	17792.78	77438.15
S_InPers_Y4	100000	55689.36	11320.69	26990.5	87015.64
S_InPers_Y5	100000	68561.57	11388.43	39614.85	101066
S_InPers_Y6	100000	84477.82	11532.89	54320.3	118381.1
S_InPers_Y7	100000	103627.5	11745.18	72177.23	138096
S_InPers_Y8	100000	125906.5	12026.06	92682.88	162009.2
S_InPers_Y9	100000	151261.1	12438.47	117165.5	189201.9
S_InPers_Y10	100000	179807	12896.24	143704.2	219118.3
S_ByMail_Y1	100000	690.824	228.2384	132.1278	1312.406
S_ByMail_Y2	100000	778.9293	222.0005	232.103	1380.028
S_ByMail_Y3	100000	909.2125	222.0149	351.3319	1529.075

S_ByMail_Y4	100000	1099.629	223.5355	532.9479	1718.19
S_ByMail_Y5	100000	1353.8	224.8731	782.2253	1995.625
S_ByMail_Y6	100000	1668.079	227.7257	1072.596	2337.526
S_ByMail_Y7	100000	2046.203	231.9175	1425.194	2726.811
S_ByMail_Y8	100000	2486.12	237.4637	1830.094	3198.994
S_ByMail_Y9	100000	2986.765	245.607	2313.522	3735.936
S_ByMail_Y10	100000	3550.425	254.6461	2837.549	4326.657
B_Reg_Y1	100000	35676.76	11787.09	6823.58	67777.59
B_Reg_Y2	100000	40226.85	11464.95	11986.68	71269.87
B_Reg_Y3	100000	46955.18	11465.69	18144.11	78967.23
B_Reg_Y4	100000	56788.99	11544.22	27523.44	88733.83
B_Reg_Y5	100000	69915.37	11613.3	40397.07	103061.6
B_Reg_Y6	100000	86145.89	11760.62	55392.9	120718.7
B_Reg_Y7	100000	105673.7	11977.1	73602.42	140822.8
B_Reg_Y8	100000	128392.6	12263.52	94512.98	165208.2
B_Reg_Y9	100000	154247.9	12684.08	119479.1	192937.8
B_Reg_Y10	100000	183357.4	13150.89	146541.8	223444.9
B_scrap	100000	2151.709	1012.589	400.0149	3898.99
NetBen_Y0	100000	-576008.8	16607.31	-604781.1	-547183.8
NetBen_Y1	100000	-616451.6	42906.67	-743985.3	-482324.8
NetBen_Y2	100000	36139.81	36400.26	-55999.36	135346.6
NetBen_Y3	100000	55502.81	35171.39	-35519.89	154630
NetBen_Y4	100000	82694.79	34213.65	-7653.762	180814.2
NetBen_Y5	100000	117387.9	33250.53	30032.93	213379.8
NetBen_Y6	100000	158206	32518.78	71825.55	255726.2
NetBen_Y7	100000	204920	32000.44	117644.6	300477.1
NetBen_Y8	100000	256514.3	31647.93	165641	354190
NetBen_Y9	100000	312190.6	31637.79	222116	408985.9
NetBen_Y10	100000	371633.6	31693.76	280443.2	468966.7
NetBen_Y10E	100000	1525.387	717.8435	283.5781	2764.068
NPV	100000	404254.9	139542	-122769.2	944540.4
NPV_k	100000	404.2549	139.542	-122.7692	944.5405

Appendix W: STATA Variable Definitions

Variable	Definition
N_TotRegs	Total new and updated registrations in a year
C_ClerkWage	Weighted average full time clerk hourly wage
C_paper_ink	Cost of individual double-sided printed piece of paper
C_PollWage	Average poll worker hourly wage
C_LeisureW~e	Leisure wage: 50% of WI median hourly wage and benefits
C_Stamp	Expected cost of 1st class stamp in real 2013 US$
P_RegByMail	% of registration activity by mail
P_RegInPer~n	% of registration activity in person at clerks' office
p_RegEDR	% of registration activity on Election Day at polls
P_IncForms	% of registration forms that are incomplete or incorrect
T_Travel	Time in minutes to make round trip to clerks' office
T_OkForms	Time in minutes to process correct forms
T_IncForms	Time in minutes to process incorrect forms
rate	Discount rate
TotOVRS_Y1	% of registration activity using OVRS in program year 1
TotOVRS_Y2	% of registration activity using OVRS in program year 2
TotOVRS_Y3	% of registration activity using OVRS in program year 3
TotOVRS_Y4	% of registration activity using OVRS in program year 4
TotOVRS_Y5	% of registration activity using OVRS in program year 5
TotOVRS_Y6	% of registration activity using OVRS in program year 6
TotOVRS_Y7	% of registration activity using OVRS in program year 7
TotOVRS_Y8	% of registration activity using OVRS in program year 8
TotOVRS_Y9	% of registration activity using OVRS in program year 9
TotOVRS_Y10	% of registration activity using OVRS in program year 10
C_Implement	Initial implementation costs
C_Maint	Annual maintenance costs
C_Adv1	Advertising and outreach costs for program year 1
C_Adv2	Advertising and outreach costs for program year 2
B_process_Y1	Clerk processing supplies and time savings program year 1
B_process_Y2	Clerk processing supplies and time savings program year 2
B_process_Y3	Clerk processing supplies and time savings program year 3
B_process_Y4	Clerk processing supplies and time savings program year 4
B_process_Y5	Clerk processing supplies and time savings program year 5
B_process_Y6	Clerk processing supplies and time savings program year 6
B_process_Y7	Clerk processing supplies and time savings program year 7
B_process_Y8	Clerk processing supplies and time savings program year 8
B_process_Y9	Clerk processing supplies and time savings program year 9
B_process~10	Clerk processing supplies and time savings program year 10
S_Clerk~p_Y1	Clerk time correct form savings program year 1
S_Clerk~p_Y2	Clerk time correct form savings program year 2
S_Clerk~p_Y3	Clerk time correct form savings program year 3
S_Clerk~p_Y4	Clerk time correct form savings program year 4
S_Clerk~p_Y5	Clerk time correct form savings program year 5
S_Clerk~p_Y6	Clerk time correct form savings program year 6

```
S_Clerk~p_Y7 |    Clerk time correct form savings program year 7
-------------+-----------------------------------------------------
S_Clerk~p_Y8 |    Clerk time correct form savings program year 8
S_Clerk~p_Y9 |    Clerk time correct form savings program year 9
S_Cler~p_Y10 |    Clerk time correct form savings program year 10
S_Clerk~b_Y1 |    Clerk time incorrect form savings program year 1
S_Clerk~b_Y2 |    Clerk time incorrect form savings program year 2
-------------+-----------------------------------------------------
S_Clerk~b_Y3 |    Clerk time incorrect form savings program year 3
S_Clerk~b_Y4 |    Clerk time incorrect form savings program year 4
S_Clerk~b_Y5 |    Clerk time incorrect form savings program year 5
S_Clerk~b_Y6 |    Clerk time incorrect form savings program year 6
S_Clerk~b_Y7 |    Clerk time incorrect form savings program year 7
-------------+-----------------------------------------------------
S_Clerk~b_Y8 |    Clerk time incorrect form savings program year 8
S_Clerk~b_Y9 |    Clerk time incorrect form savings program year 9
S_Cler~b_Y10 |    Clerk time incorrect form savings program year 10
B_ClerkLab~1 |    Total clerk form processing time savings program year 1
B_ClerkLab~2 |    Total clerk form processing time savings program year 2
-------------+-----------------------------------------------------
B_ClerkLab~3 |    Total clerk form processing time savings program year 3
B_ClerkLab~4 |    Total clerk form processing time savings program year 4
B_ClerkLab~5 |    Total clerk form processing time savings program year 5
B_ClerkLab~6 |    Total clerk form processing time savings program year 6
B_ClerkLab~7 |    Total clerk form processing time savings program year 7
-------------+-----------------------------------------------------
B_ClerkLab~8 |    Total clerk form processing time savings program year 8
B_ClerkLab~9 |    Total clerk form processing time savings program year 9
B_ClerkLa~10 |    Total clerk form processing time savings program year 10
B_PollLabo~1 |    Poll worker labor savings program year 1
B_PollLabo~2 |    Poll worker labor savings program year 2
-------------+-----------------------------------------------------
B_PollLabo~3 |    Poll worker labor savings program year 3
B_PollLabo~4 |    Poll worker labor savings program year 4
B_PollLabo~5 |    Poll worker labor savings program year 5
B_PollLabo~6 |    Poll worker labor savings program year 6
B_PollLabo~7 |    Poll worker labor savings program year 7
-------------+-----------------------------------------------------
B_PollLabo~8 |    Poll worker labor savings program year 8
B_PollLabo~9 |    Poll worker labor savings program year 9
B_PollLab~10 |    Poll worker labor savings program year 10
 S_InPers_Y1 |    Registration in person cost savings program year 1
 S_InPers_Y2 |    Registration in person cost savings program year 2
-------------+-----------------------------------------------------
 S_InPers_Y3 |    Registration in person cost savings program year 3
 S_InPers_Y4 |    Registration in person cost savings program year 4
 S_InPers_Y5 |    Registration in person cost savings program year 5
 S_InPers_Y6 |    Registration in person cost savings program year 6
 S_InPers_Y7 |    Registration in person cost savings program year 7
-------------+-----------------------------------------------------
 S_InPers_Y8 |    Registration in person cost savings program year 8
 S_InPers_Y9 |    Registration in person cost savings program year 9
S_InPers_Y10 |    Registration in person cost savings program year 10
 S_ByMail_Y1 |    Registration by mail cost savings program year 1
 S_ByMail_Y2 |    Registration by mail cost savings program year 2
-------------+-----------------------------------------------------
 S_ByMail_Y3 |    Registration by mail cost savings program year 3
```

S_ByMail_Y4	Registration by mail cost savings program year 4
S_ByMail_Y5	Registration by mail cost savings program year 5
S_ByMail_Y6	Registration by mail cost savings program year 6
S_ByMail_Y7	Registration by mail cost savings program year 7
S_ByMail_Y8	Registration by mail cost savings program year 8
S_ByMail_Y9	Registration by mail cost savings program year 9
S_ByMail_Y10	Registration by mail cost savings program year 10
B_Reg_Y1	Registration activity cost savings program year 1
B_Reg_Y2	Registration activity cost savings program year 2
B_Reg_Y3	Registration activity cost savings program year 3
B_Reg_Y4	Registration activity cost savings program year 4
B_Reg_Y5	Registration activity cost savings program year 5
B_Reg_Y6	Registration activity cost savings program year 6
B_Reg_Y7	Registration activity cost savings program year 7
B_Reg_Y8	Registration activity cost savings program year 8
B_Reg_Y9	Registration activity cost savings program year 9
B_Reg_Y10	Registration activity cost savings program year 10
B_scrap	Scrap value of hardware at end of 10 years
NetBen_Y0	Discounted Net Benefits at beginning of program year 1
NetBen_Y1	Discounted Net Benefits at middle of program year 1
NetBen_Y2	Discounted Net Benefits at middle of program year 2
NetBen_Y3	Discounted Net Benefits at middle of program year 3
NetBen_Y4	Discounted Net Benefits at middle of program year 4
NetBen_Y5	Discounted Net Benefits at middle of program year 5
NetBen_Y6	Discounted Net Benefits at middle of program year 6
NetBen_Y7	Discounted Net Benefits at middle of program year 7
NetBen_Y8	Discounted Net Benefits at middle of program year 8
NetBen_Y9	Discounted Net Benefits at middle of program year 9
NetBen_Y10	Discounted Net Benefits at middle of program year 10
NetBen_Y10E	Discounted Net Benefits at end of program year 10
NPV	Net Present Value of OVRS Implementation
NPV_k	Net Present Value of OVRS Implementation in thousands

Appendix X: Scrap Value

We calculate the hardware scrap value of the OVRS server hardware at end of ten years from a lower bound of University of Wisconsin's Surplus With A Purpose (SWAP) computer prices as of November 2013.[51] The upper bound is from eBay completed listing prices as of November 18 2013.[52]

[51] University of Wisconsin Surplus With A Purpose (SWAP). 2013. List prices for used SQL servers. Accessed November 18, 2013: http://www.bussvc.wisc.edu/swap/.
[52] Ebay. 2013. Final bid prices for used SQL servers. Accessed November 18, 2013: http://www.ebay.com.

Appendix Y: Municipality Population and Size

We obtained population data for each of Wisconsin's municipalities from the Wisconsin Demographic Services Center.[53]Municipalities were classified as "small" if their population was less than 50,000; "medium" if between 50,001 and 199,999; and "large" for cities with populations over 200,000. Municipality size was defined this way to match the breakdown used in the GAB Fiscal Estimate LRB 13-0058/1.[54]

[53] Wisconsin Demographic Services Center. 2013. "Official Estimates, 1/1/2013, Wisconsin Municipalities, with Comparison to Census 2010." Madison: Department of Administration. Retrieved from: http://www.doa.state.wi.us/docview.asp?docid=10420&locid=9

[54] GAB. 2013c.