



RICE

Now Do Voters Notice Review Screen Anomalies?

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THE COMPUTER-HUMAN
INTERACTION LABORATORY AT RICE UNIVERSITY

Usability and Security

- Consider the amount of time and energy spent on voting system security, for example:
 - California's Top-to-Bottom review
 - Ohio's EVEREST review
 - Many other papers past and present EVT/WOTE
- This despite a lack of conclusive evidence that any major U.S. election has been stolen due to security flaws in DREs
 - Though of course this *could* have happened
- But we know major U.S. elections have turned on voting system usability



U.S. REPRESENTATIVE IN CONGRESS
13TH CONGRESSIONAL DISTRICT
(Vote for One)

Vern Buchanan	REP	<input type="checkbox"/>
Christine Jennings	DEM	<input type="checkbox"/>

STATE

GOVERNOR AND LIEUTENANT GOVERNOR
(Vote for One)

Charlie Crist	REP	<input type="checkbox"/>
Jeff Kottkamp		
Jim Davis	DEM	<input type="checkbox"/>
Daryl L. Jones		
Max Linn	REF	<input type="checkbox"/>
Tom Macklin		
Richard Paul Dembinsky	NPA	<input type="checkbox"/>
Dr. Joe Smith		
John Wayne Smith	NPA	<input type="checkbox"/>
James J. Kearney		
Karl C.C. Behm	NPA	<input type="checkbox"/>
Carol Castagnero		
Write-In		<input type="checkbox"/>

Usability and Security

- There are numerous other examples of this
 - See the 2008 Brennan Center report
- This is not to suggest that usability is more important than security
 - Though we'd argue that it does deserve equal time, which has not been the case
- Furthermore, usability and security are intertwined
 - The voter is the first line of defense against malfunctioning and/or malicious systems
 - Voters may be able to detect when things are not as they should be
 - ◆ The oft-given “check the review screen” advice



Usability and Review Screens

- Other usability findings from our previous work regarding DREs vs. older technologies
 - Voters are **not** more accurate voting with a DRE
 - Voters are **not** faster voting with a DRE
 - However, DREs are vastly preferred to older voting technologies
- But do voters actually check the review screen?
 - Or rather, how closely do they check?
 - Assumption has certainly been that voters do
- Everett (2007) research
 - Two experiments on review screen anomaly detection using the VoteBox DRE



STEP 1
Read Instructions

STEP 2
Make your choices

STEP 3
Review your choices

STEP 4
Record your vote

Review Choices

Below are the choices you have made. If you would like to make changes, click on the race you would like to change.

If you do not want to make changes, click the 'Next Page' button to go to Step 4.

****Your vote will not be recorded unless you finish step 4.****

President :	Vernon Stanley Albur	Judge on Court of Criminal Appeals :	Dan Plouffe
Vice President :	Richard Rigby		
United States Senator :	None	District Attorney of Harris County :	None
US House of Representative :	None	County Treasurer of Harris County :	None
Govenor of Texas :	None	Sheriff of Harris County :	None
Lieutenant Govenor of Texas :	Cassie Principe	County Tax Assessor of Harris Country :	None
Attorney General of Texas :	Tim Speight	Justice of the Peace of Harris County :	None
Comptroller of Public Accounnts :	Greg Converse	County Judge of Harris Country :	None
Commissioner of General Land Office :	Sam Saddler	Proposition 1 :	Yes
Commissioner of Agriculture :	Roberto Aron	Proposition 2 :	No
Railroad Commisioner of Texas :	Jillian Balas	Proposition 3 :	Yes
State Senator of Texas :	None	Proposition 4 :	No
State Representative of Texas :	None	Proposition 5 :	None
State Board of Education :	Mark Baber	Proposition 6 :	None
Presiding Judge on Texas Supreme Court :	Tim Grasty		

Click to go back to previous race

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Click to go to Step 4: Record your vote

Next Page→

Everett (2007)

- Results of two studies on anomaly detection
 - First study: **32%** noticed the anomalies
 - Second study: **37%** noticed the anomalies
- Also examined what other variables did and did not influence detection performance
- Affected detection performance:
 - Time spent on review screen
 - Whether or not voters were given a list of candidates
- Did not affect detection performance:
 - Number of anomalies
 - Location on the ballot of anomalies



STEP 1 Read Instructions

STEP 2 Make Your Choices

You are now on:

STEP 3 Review Your Choices *Important*

STEP 4 Record Your Vote

Review Choices

Below are the choices you have made. If you would like to make changes, click on the race you would like to change. **Please be sure to review your choices and correct any mistakes *before* casting your ballot.**

If you do not want to make changes, click the 'Next Page' button to go to Step 4.

****Your vote will not be recorded unless you finish step 4.****

President :	Gordon Bearce	R	Judge on Court of Criminal Appeals :	None	
Vice President :	Nathan Maclean				
United States Senator :	Fern Brzezinski	D	District Attorney of Harris County :	Jennifer A. Lundeed	D
US House of Representative :	Pedro Brouse	R	County Treasurer of Harris County :	None	
Govenor of Texas :	None		Sheriff of Harris County :	Stanley Saari	R
Lieutenant Govenor of Texas :	None		County Tax Assessor of Harris Country :	None	
Attorney General of Texas :	None		Justice of the Peace of Harris County :	None	
Comptroller of Public Accountnts :	Therese Gustin	I	County Judge of Harris Country :	Dan Atchley	R
Commissioner of General Land Office :	None		Proposition 1 :	Yes	
Commissioner of Agriculture :	Roberto Aron	D	Proposition 2 :	Yes	
Railroad Commisioner of Texas :	None		Proposition 3 :	None	
State Senator of Texas :	None		Proposition 4 :	None	
State Representative of Texas :	Petra Bencomo	R	Proposition 5 :	Yes	
State Board of Education :	None		Proposition 6 :	No	
Presiding Judge on Texas Supreme Court :	None				

Click to go back to previous contest

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Click to go to Step 4: Record your vote

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Results: Anomaly Detection

- **50%** of voters detected the review screen anomalies
 - 95% confidence interval: 40.1% to 59.9%
 - Clear improvement beyond Everett (2007), but still less than ideal
- So, what drove anomaly detection?
 - Time spent on review screen ($p = .003$)
 - Anomaly type ($p = .02$)
 - Self-reported care in checking review screen ($p = .04$)
- Non-significant factors
 - Age, education, computer experience, news following, personality variables



How It All Got Started

- I have been doing interdisciplinary work since I was an undergraduate (dual major Psyc & Engineering)
 - Master's in Computer Science along with Psych Ph.D.
 - “Applied Cognitive Science” Most of my work is in computational modeling of human cognition for HF/HCI
- But I never thought about voting until:
 - I gave a talk at Rice in CS about the importance of usability
 - Dan Wallach (CS security type) called me because “even if we can engineer a voting system that's secure, if nobody can actually use it, that won't solve the problem”
- Joined ACCURATE and have been doing voting ever since

