

Electronic Voting Workshop

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May I introduce myself



Principal Investigator DemTech
(2011)

Associate Professor, ITU
(2005 - now)

Assistant Professor, Yale
(2000 – 2005)

PhD, Carnegie Mellon University
(2000)



Technology and Democracy



- Social Media
- Information Technology
- Communication

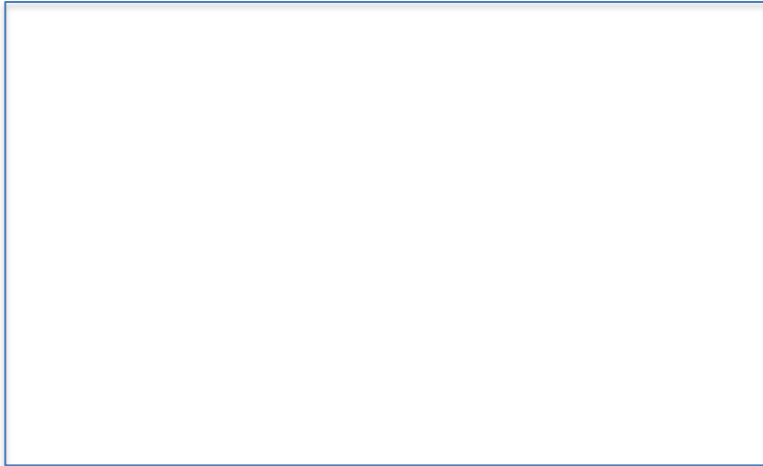
Not a unique phenomenon

- People have a way to organize, exert power
- Impacts all different kind forms of state.

Today's Workshop

- The State of the Art
- Break
- Reflections of voting in Denmark
- Break
- Linear Logical Voting Protocols

No Election



Electronic Election



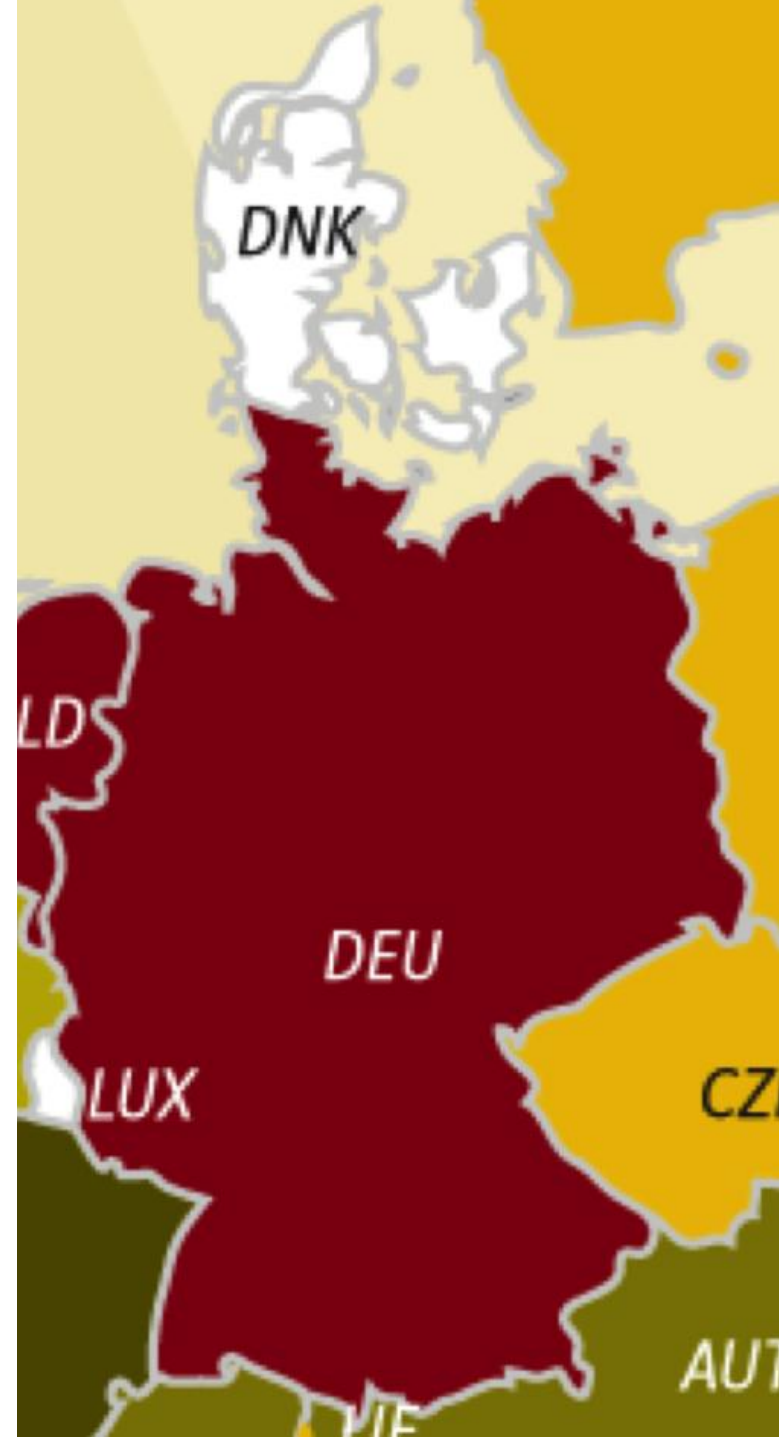
Traditional Election

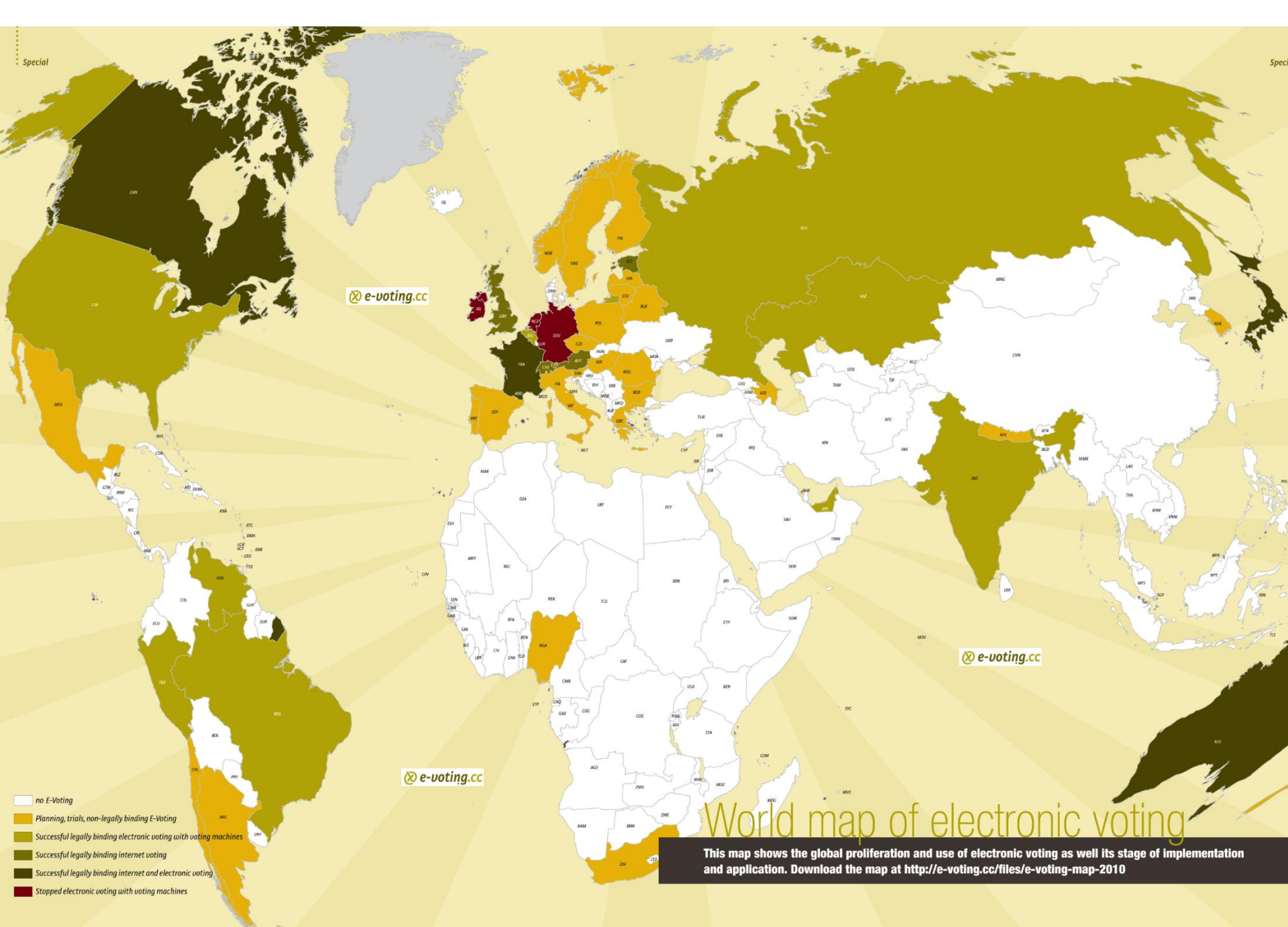


Internet Election/Remote Voting

“The use of electronic voting machines in parliamentary elections is unconstitutional as long as it is not possible for citizens to exercise their right to inspect and verify the essential steps of the election.”

*German Supreme Court
March 3rd, 2009*





Special

Special

e-voting.cc

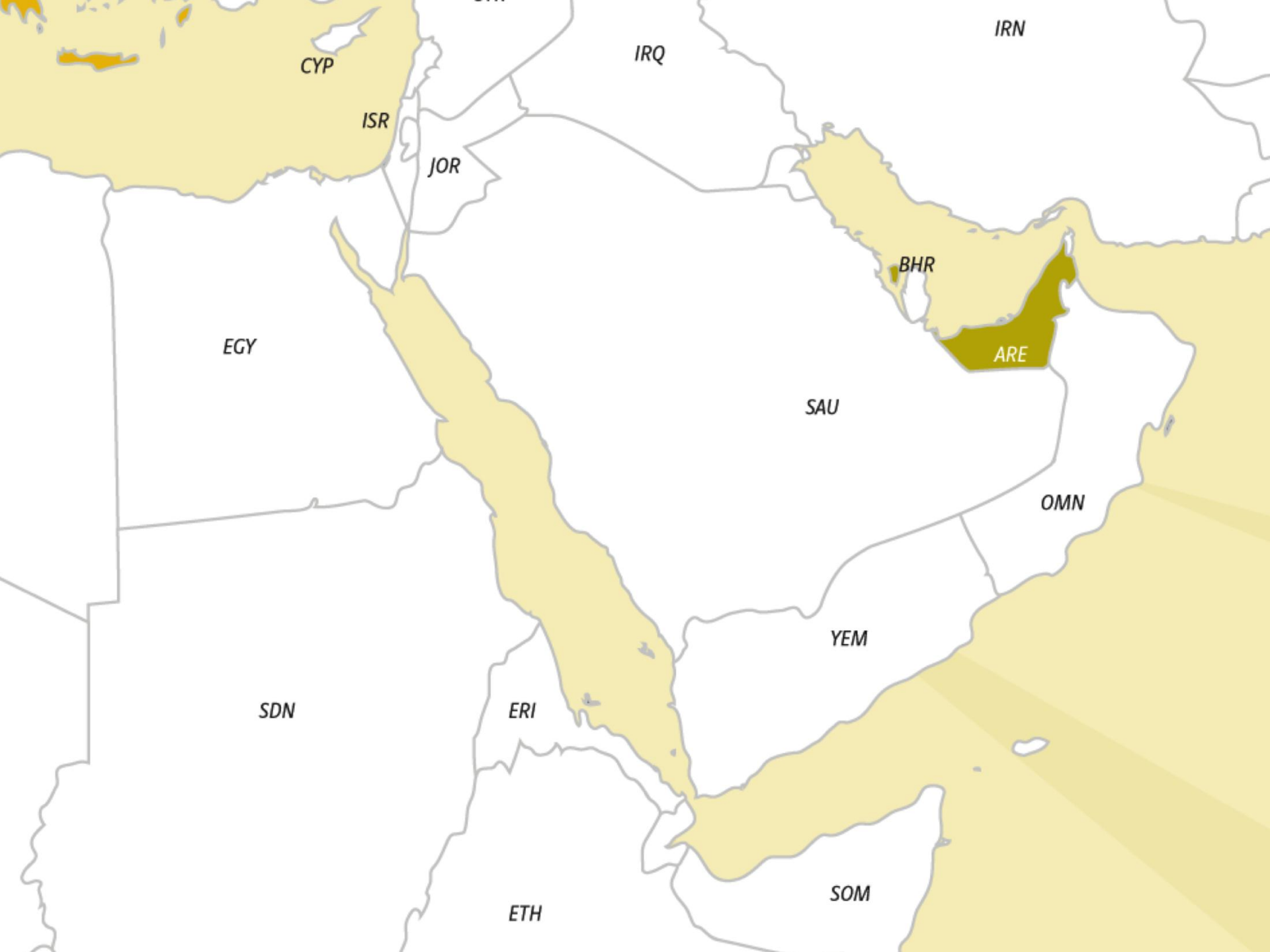
e-voting.cc

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- no E-Voting
- Planning, trials, non-legally binding E-Voting
- Successful legally binding electronic voting with voting machines
- Successful legally binding internet voting
- Successful legally binding internet and electronic voting
- Stopped electronic voting with voting machines

World map of electronic voting

This map shows the global proliferation and use of electronic voting as well its stage of implementation and application. Download the map at <http://e-voting.cc/files/e-voting-map-2010>



CYP

ISR

JOR

EGY

SDN

ERI

ETH

IRQ

SAU

BHR

ARE

YEM

OMN

SOM

IRN

Question 1

Why do governments play with the idea of using computers in the process?

- To be modern
- To be more efficient
- To be more inclusive
- To be more precise
- To increase the voter's trust

Question 2

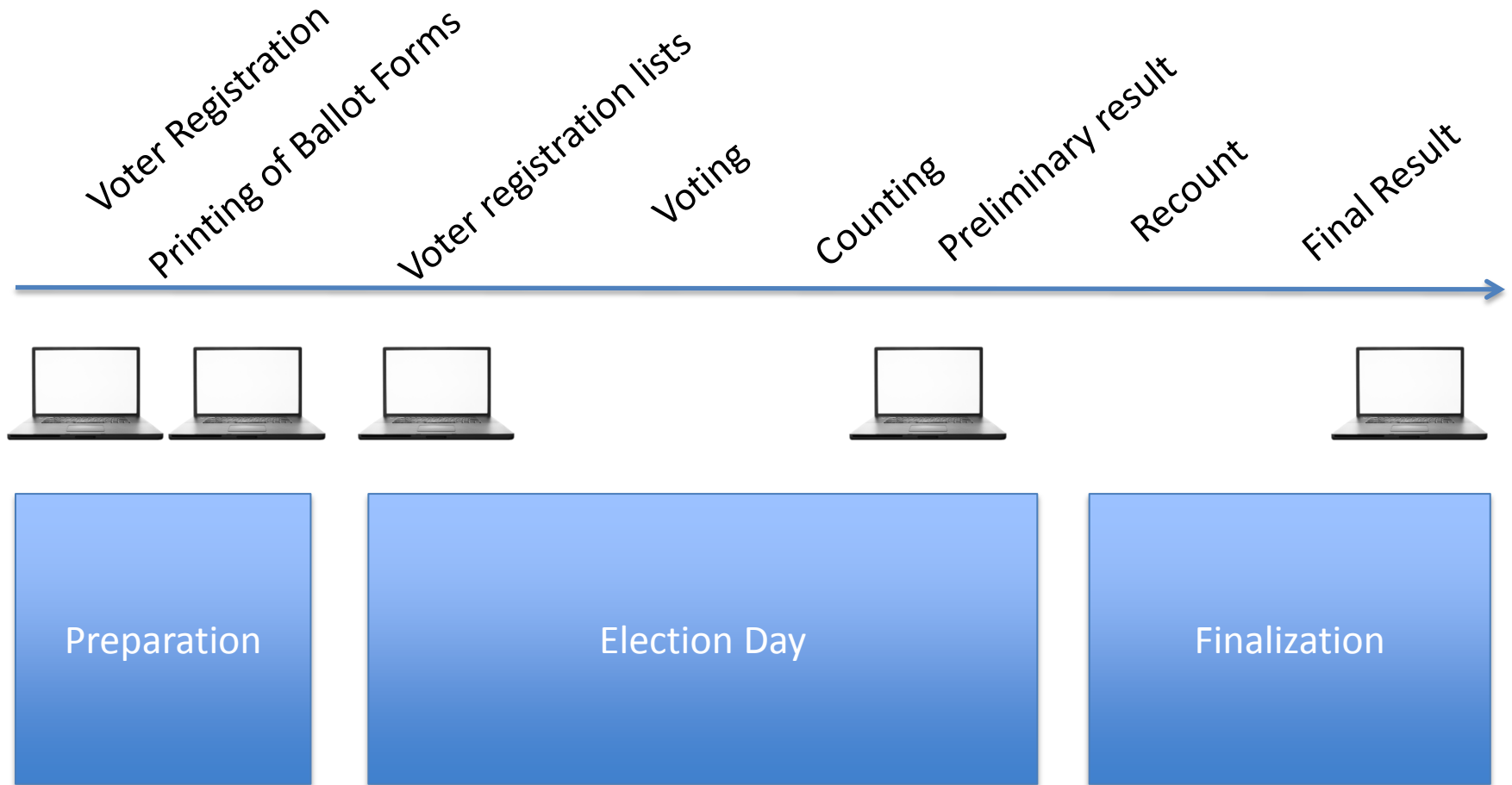
Why are scientists critical of the use of technology in voting?

- Elections as a critical system
- Erosion of collective trust
- Loss of transparency and public control
- Complexity of security
- Programmer errors and hacker attacks

Electronic Elections Research

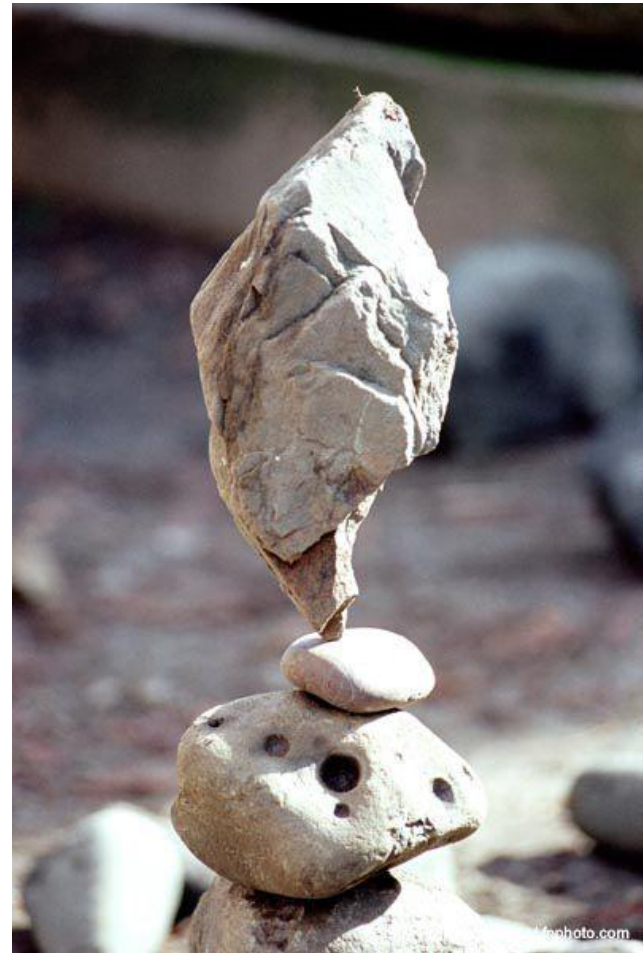
- Good questions deserve good answers
- Good answers require good research
- Provide necessary background for risk analysis
 - The expected price to pay for doing it
 - The expected price to pay for not doing it
- Providing good technology and algorithms
- Ethnographies about the traditional process
- Take advantage of new opportunities to evolve the democratic process

The Democratic Process



Vision Statement [West]

It is possible to modernize the electoral process while balancing the trust of the people on the trustworthiness of the deployed technology.



Vision Statement [Middle East]

It is possible to accelerate the creation of collective trust by building (modernizing) an electoral process using information technology.



Key Indicators

- Collective trust
 - Perception, culture, rituals
- Degree of computerization
 - Digital voter list, vote casting
 - Vote tallying, final results
- Mechanics of the process
 - Vulnerabilities
 - Control mechanism
- Voter Participation



Global Experience Reports

Controlled Environment
Machines in a Voting Booth

Netherlands



- Computers used in the election since the mid 1980s
- Voting machines simple computers
- Easily hacked by Gonggrijp et al to change election
- Even taught to play chess

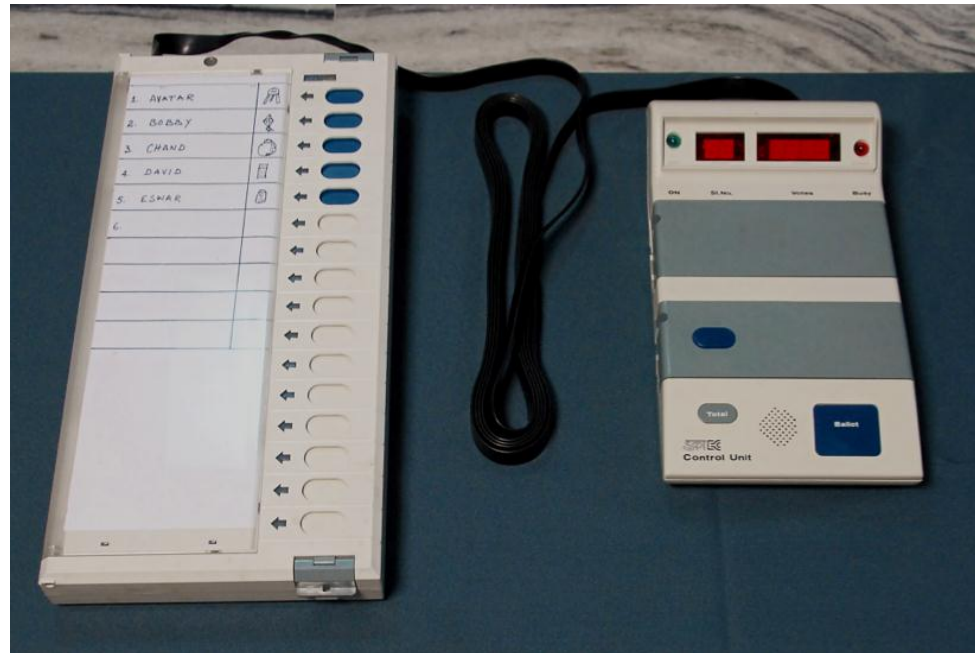
Netherlands (cont'd)



- Votes broadcast via GPRS modem
- Security audits
- Machines are now outlawed [2006]
- Threat to collective trust

India

- 1.4 mil. EVMs
- Security analysis [Prasad, Halderman, Gonggrijp 2009]
- Vulnerabilities, Hardware attack
- “perfect”
- Ballot stuffing
- Prasad arrested
for his activism
[2010]
- Halderman, Gonggrijp:
detained @Delhi 18h



USA

HAVA

- Help America Vote Act
- Forced municipalities
 - Buy voting machine
 - No vetting
 - Little support for certification
 - no funding for long-term support
- Certification for hardiness



USA (cont'd)

- Ed Felten et al [2006]
- AccuVote-TS
- Minibar key 400
- Flash Memory
- No authentication



Analyzing a US voting machine is a federal offense.

Ireland



- Nedap machines purchased hours before e-voting experts scheduled to report to government committee
- Kiniry kicked off of subcommittee of CEV for asking the wrong questions

Bahrain

- Electronic election planned for 2006
- Bahrain's king annuls plans

Since then no electronic elections.



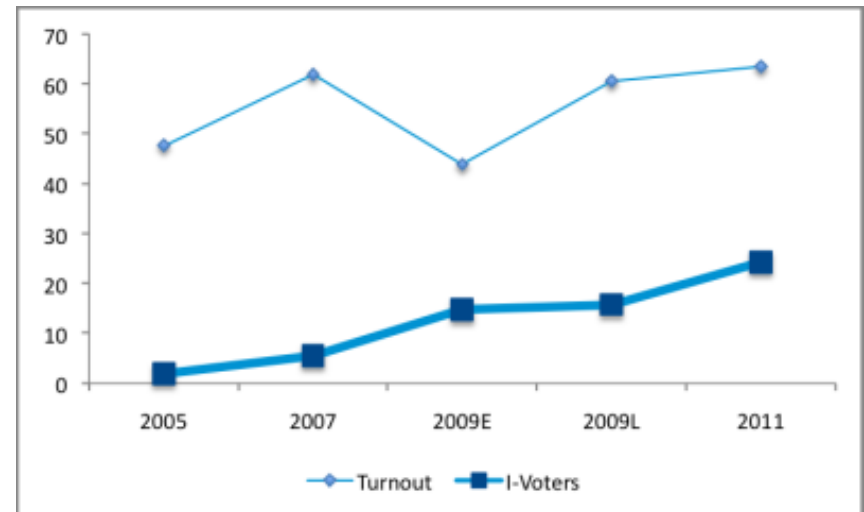
Global Experience Reports

Uncontrolled Environment

Internet Elections

Estonia

- Internet presidential election since 2005
- Young and growing democracy
- 10% in 2009
- 24% in 2011
- Complaint to supreme court
- 1 lost ivote



Norway

- September 2011
- Internet election
- 10 municipalities
- 55785 votes cast
- 63% voter participation
(increase of 6%)
- 74 wrong return code



United Arab Emirates 2007



**Enhancing Trust in e-Voting through Knowledge
Management: The Case of the UAE**

Fadi Salem
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Dubai School of Government
www.dsg.ae

- Playing with ideas since 2006
- Inching carefully forward
- Planned to have internet elections in 2011
- Not clear if they did.



Ministry of Local Government (Norway)

ScytI, in partnership with ErgoGroup, was selected by the Norwegian Ministry of Local Government and Regional Development to offer a secure Internet voting platform to selected municipalities in the 2011 municipal elections. Voters in these selected municipalities will be able to cast their votes over the Internet either from polling stations or remotely from anywhere in the world. A full nationwide rollout of the Internet voting system is scheduled for 2017.



State of Gujarat (India)

ScytI was awarded, in partnership with Tata Consultancy Services, a 5-year contract to provide the State of Gujarat with a permanent Internet voting platform to conduct its municipal elections. The State of Gujarat with a population of 50 million people has become the first Indian state to implement Internet voting in public elections.



United Arab Emirates

Ministry for the Federal National Council Affairs (UAE)

ScytI, in partnership with Logica, has been awarded a contract by the UAE Ministry for the Federal National Council Affairs to provide e-voting in their upcoming elections to the Federal National Council that will be held in September 2011. E-voting will be deployed countrywide as the only voting method and will be used in conjunction with the country's national e-ID card provided by the Emirates Identity Authority (EIDA). Along with its secure e-voting technology, ScytI will also provide its electronic pollbook to help manage the electoral roll in all seven Emirates and provide 'vote anywhere' capabilities during the election.

USA

Alex Halderman [2010]

- D.C. Internet voting pilot
- military voters may download and return absentee ballots
- Uses exploit
- Shell-injection vulnerability

Thank You!

Ballot Received
2:31 PM, October 01, 2010

Check the status of your ballot at any time at the Board of Elections and Ethics [website](#).

```
"ballot.$(sleep 10)pdf"
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Our Vision/Mission

Technology Can Help

Claim 1:

Technology can help

Claim 2:

Social, Political,
Local cultural aspects
are critical

Conclusion:

*Nothing is going forward
without science.*



Denmark

IT University of Copenhagen,
Municipalities, and Industry
work together

Very good, trusting
relationship with authorities
free access to information

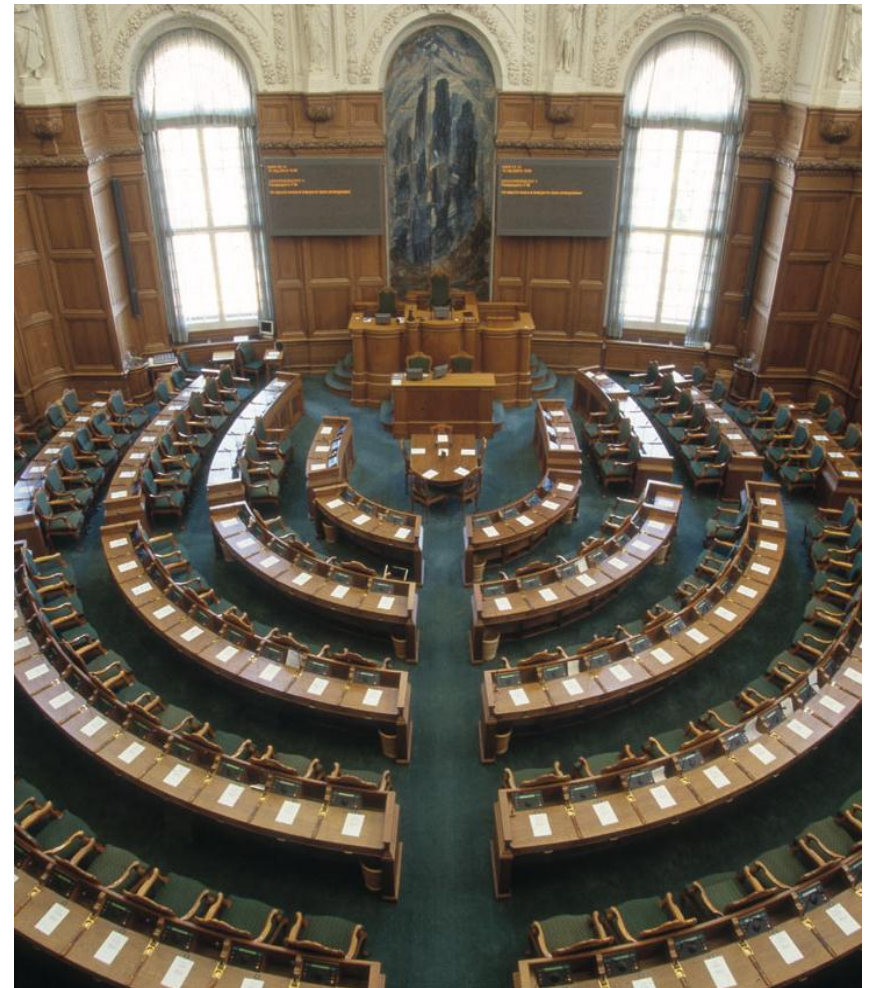


Working with Danish Authorities

More and more requests to modernize the Danish voting process

- Technology offers great benefits
- National Strategies

Illusion: Stability of the Electoral process



Danish Democratic Process

- [1849] Danish Election Law, show of hands
- [1901] Secret ballots
- [1915] Women's right to vote
- [1920] Vote by letter (for sailors), relaxed '53
- [1953] Folketinget
- [1970] Danish abroad, right to vote for Folketinget
- [1978] Legal voting age: 18
- [1984] Rosengreens software for seat assignment
- [2009] The blind must not vote without supervision

Strategic Research Alliance



Opportunity:

We could tackle the

- ethnographic
- computer science
- engineering

challenges together

جامعة كارنيغي ميلون في قطر
Carnegie Mellon Qatar

