Smart Grid Adoption by U.S. Utilities: Organizational Drivers and Impacts

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Smart grid raises organizational challenges for utilities

- A new set of emerging technologies with evolving standards
- New vendors developing those technologies
- Utility organizations historically conservative adopters of technology
- Regulatory process favors low-risk investment in stable technologies

Research questions

- 1. What organizational characteristics impact utility adoption of smart grid technologies?
- 2. What kinds of organizational challenges are faced by utilities as they deploy smart grid technologies?
- 3. How do utility companies respond to these challenges?

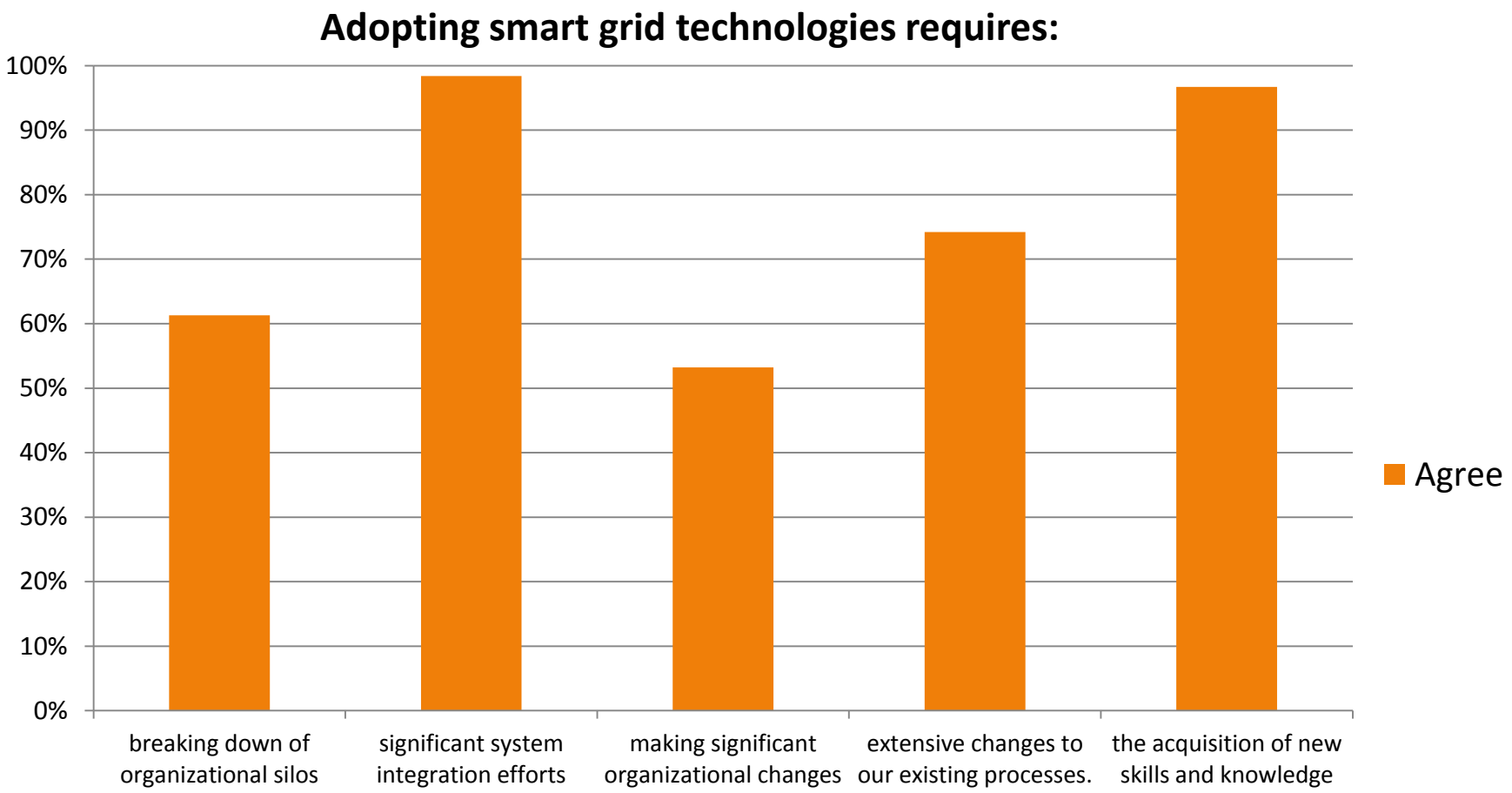
Research methods

- 46 interviews with
  - 24 utilities, including IOUs, municipals and cooperatives
  - 2 current and former PUC members
  - 2 vendors
  - One ISO
- Survey of 145 utilities (in progress)

Org factors influencing SG adoption

- Top management leadership
- Experience with precursor technologies
- Tech champions/change agents
- Culture of innovation
- Ownership form: Municipals and co-ops more flexible. IOUs have more resources.

Organizational challenges



Source: Syracuse University survey of U.S. utility companies: Preliminary results as of 10/1/14.

Organizational skills challenge

- New skills and knowledge.
  - System integration
  - Technology evaluation and testing
  - Business process change—smart grid crosses and integrates formerly distinct processes.
  - Data management and analysis
  - Project management

Perceived skill/knowledge levels

Source: Syracuse University survey of U.S. utility companies: Preliminary results as of 10/1/14.

Responses to knowledge demands

- Internal training and hiring.
  - Especially for long-term ability to maintain a system
  - "There's a huge learning curve, but now we've got people who have excellent knowledge of the system."
- External knowledge acquisition
  - For one-time jobs, such as meter installation
  - When internal workers lack specialized skills, such as data warehousing, or system deployment

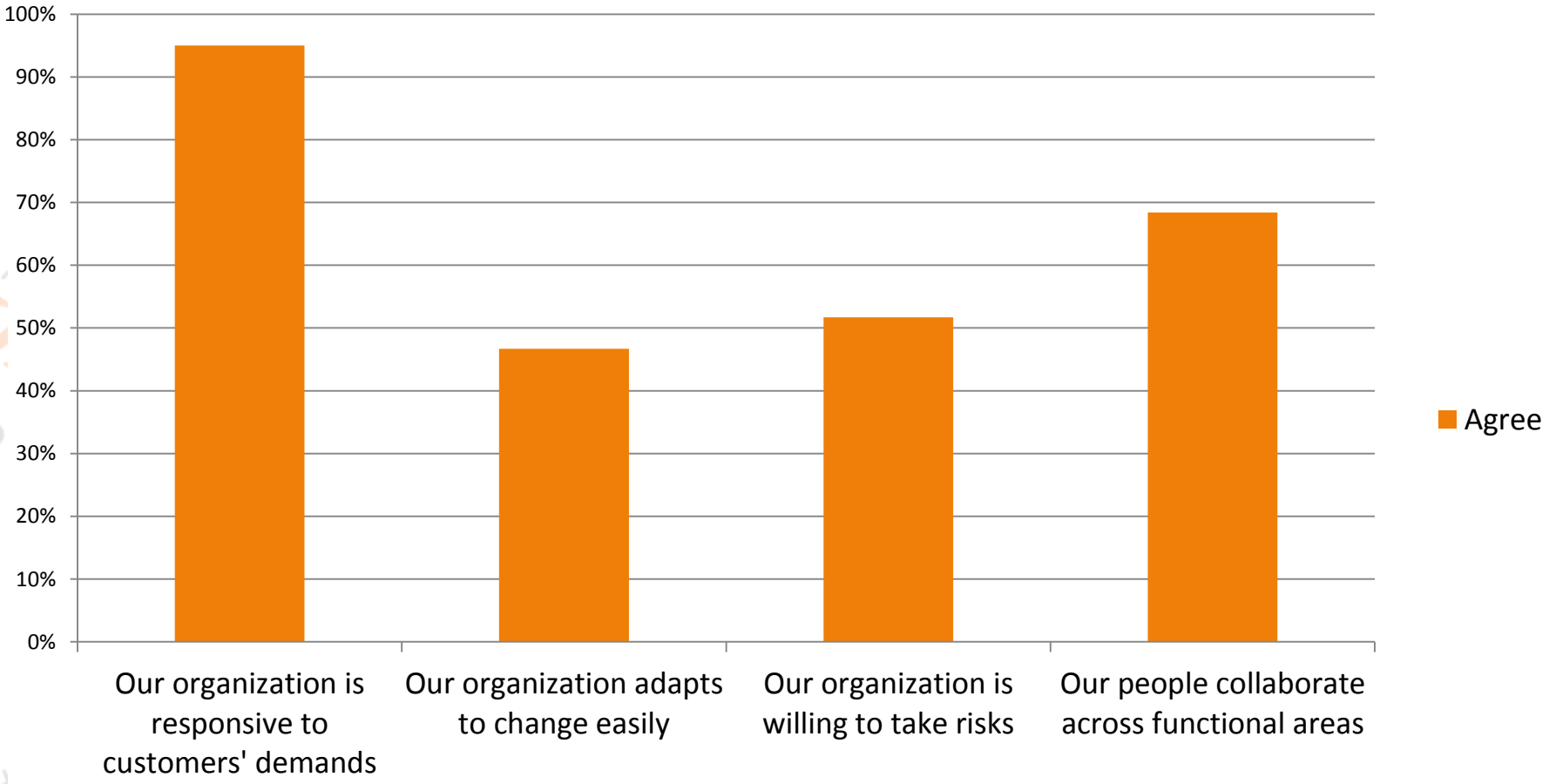
Why choose internal or external?

- Experience with related technologies makes utilities more likely to choose internal
- Difficult-to-find skills more likely to be outsourced.
- Impact of financial resources less clear
  - Can afford to hire or buy
  - Likely to deploy more capabilities

Organizational barriers challenge

- Breaking down organizational barriers.
  - System integration and data sharing are crucial to getting value from smart grid
  - Standards-based platforms are necessary to integrate systems and data
  - New organizational forms needed

Readiness to change



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Org responses

- New governance mechanisms
  - Steering committees, cross-unit teams
  - Utility transformation programs focusing on process change, skills, internal education
- Changing organizational culture to foster collaboration and innovation
  - Scary to some employees, but many are excited

Customer relationship challenge

- New customer relationship model
- Relationship is more transparent and collaborative.
  - Customers want tools to control usage. They can be partners in efficiency and demand response
  - Distributed generation makes customers "prosumers"
  - Customers expect more information, e.g., during an outage

Utility responses

- Customer outreach before deployment
  - The more extensive the outreach, the fewer problems with customer resistance
  - Need to listen as well as talk
- Trust building efforts
- Provide tools such as web portals, mobile apps, to provide access to data

Conclusions

- Smart grid deployment depends in large part on the size, resources, experience and knowledge of utilities
- Adoption creates new, unfamiliar challenges, requiring new skills/knowledge and organizational change
- Utilities are responding with a mix of learning strategies and governance structures.