Social Acceptance

~ threats to effective smart grid deployment and power systems resilience

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The Engineering Strait Jacket?

Culture of Disengagement (E A Cech, 2014)

How do students' public welfare beliefs change during their engineering education?

How do engineering programs address social issues?

How does program emphasis affect students' public welfare beliefs?

Science, Technology, and Human Values; January 2014; 30:1; pp42 - 72

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The Engineering Strait Jacket?

Culture of Disengagement (E A Cech, 2014)

"Concern and commitment to social welfare declines *significantly* over the course of engineering degree programs"

Engineering programs have ideological pillars that discount social consideration

Science, Technology, and Human Values; January 2014; 30:1; pp42 - 72

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Effect on Engineering Design?

Technically effective, socially unacceptable products

Misconceptions of product risk due to distrust

- “Smart meters cause cancer”
- “Smart meters lead to price hikes”
- “the NSA will use the meters to monitor us”
- …

Why does Social Engagement Matter?

DOE Pillars for Effective Smart Grid Performance

1. Self Healing Capabilities

2. Resilient Operation against Physical or Cyber Attacks

1. Demand Response

    Active Customer Participation

    Load Smoothing and Dynamic/Responsive Pricing

Study of Consumer Engagement…

Technology Acceptance Model

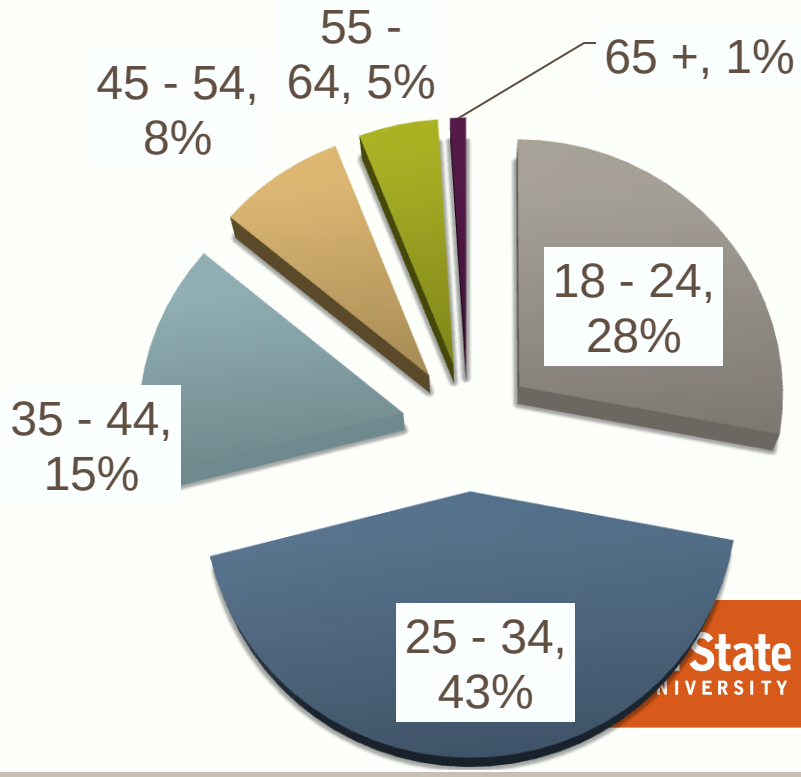
Trust, Perceived Risk, Performance Expectancy, and Ease of Use, determine "Intent to Adopt"

Survey Analysis

7-point Likert Scale

Cronbach alpha validation (> 0.7)

n = 1396



Root Cause of Aversion to Smart Meters…

Technology Acceptance Model

Trust, Perceived Risk, Performance Expectancy, and Ease of Use, determine "Intent to Adopt"

H1: Trust in a utility company has a positive impact on Intention to Use

Insignificant

H2: Trust in utility companies will have a negative impact on Perceived Risk

Supported

H3: Perceived Risk will have a negative impact on Intention to Use

Supported

Additional Hypotheses…

H4: Trust in utility companies will have a positive impact on Expected Utility

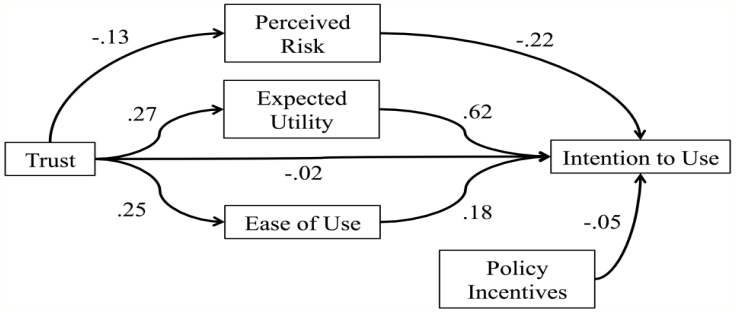
Supported

H5: Expected Utility will have a positive impact on Intention to Use

Supported

H6: Trust in utility companies will have a positive impact on Ease of Use

Supported



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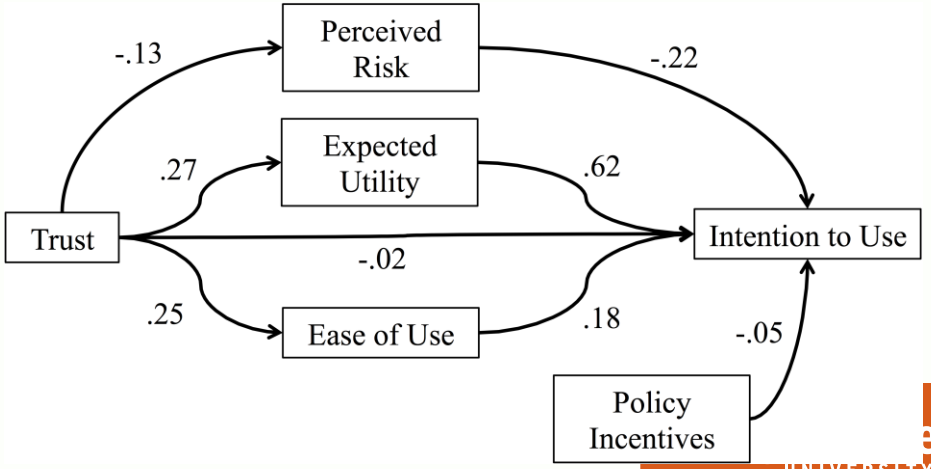
Additional Hypotheses…

H7: Ease of Use will increase the Intention to Use smart grid technology

Supported

H8: Policy Incentives increase Intention to Use

Insignificant



Conclusion

Trust is essential for consideration, but does not imply intent to adopt technology

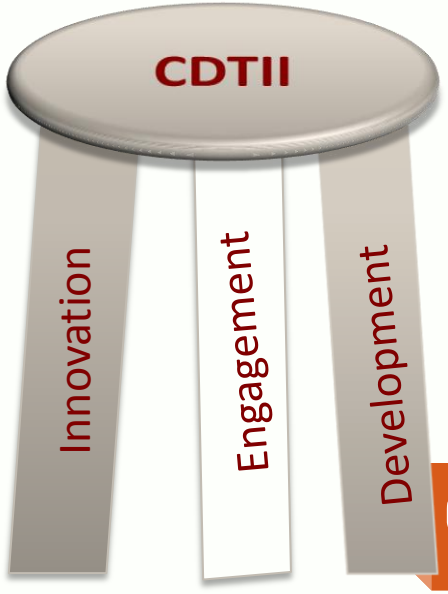
Trust gives opportunity to demonstrate effectiveness, ease of use, and other benefits

Next steps: How can we help Engineering students retain social awareness in addition to professional growth?

Implications for Engineering Education

Community Driven Technology Innovation and Investment

Facilitating environments in which engineering students retain social engagement values.



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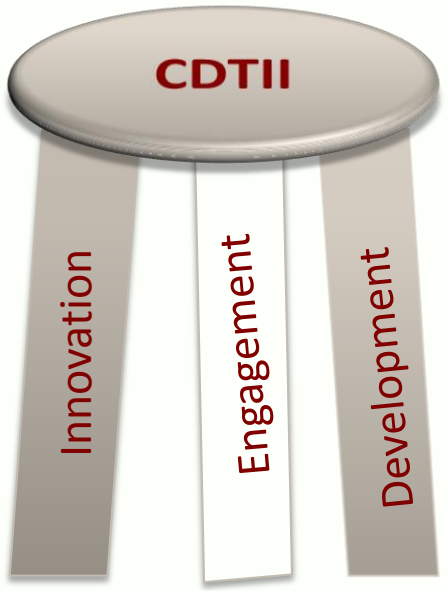
Engineering Engagement? Let's Create a Model!

Broad Phases of Design

1. Conceptual Design

2. Detailed Design

3. Implementation



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Sustainable Partnership - CDTII

Community Opportunity-Phase 1

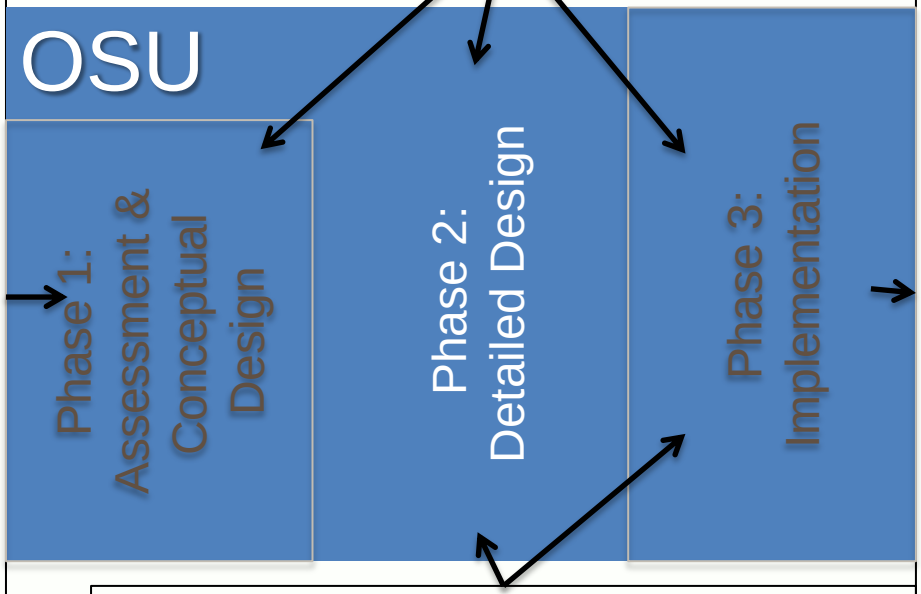
1. Underutilized Assets
2. Persistent Needs

Sustainable Community Wellbeing

1. Community investment partnership (policy, local and external funding, etc)
2. Impact Evaluation (CL@SE, Rural Studies, & Engineering Resource)

Community Partnership

1. CL@SE & Rural Studies (engagement and need articulation)
2. Engineering Resource (technical requirement articulation)



Community Benefit

1. Jobs!
2. Implementation (partnership with Engineering Teams)
3. Effectiveness and sustainability (partnership with CL@SE, Rural Studies and ENGR Resource)
4. Workforce capability
5. Asset Utilization

Workforce Development

1. Use development process in curriculum development
2. Community involvement in design process (Engineering Test & Implementation Teams)

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Phase 1: Sopes in Monroe!

Engagement Roadmap

Internal Coalition Building - OSU

CL@SE

OSU Open Campus

OSU Rural Studies

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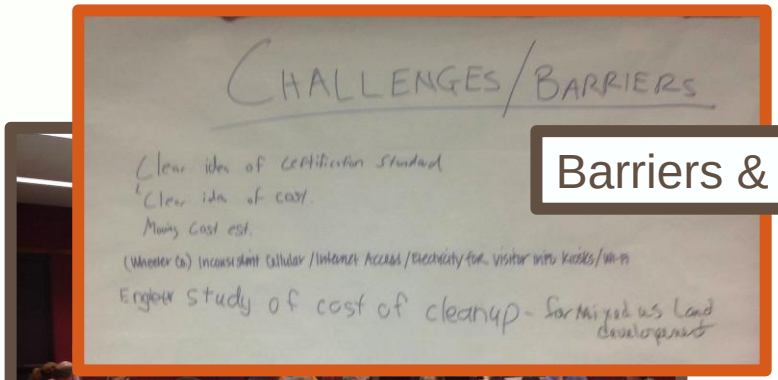
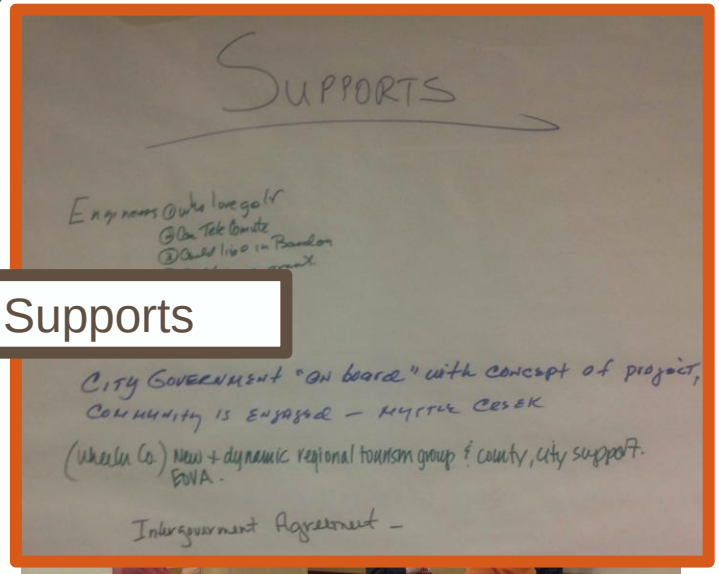
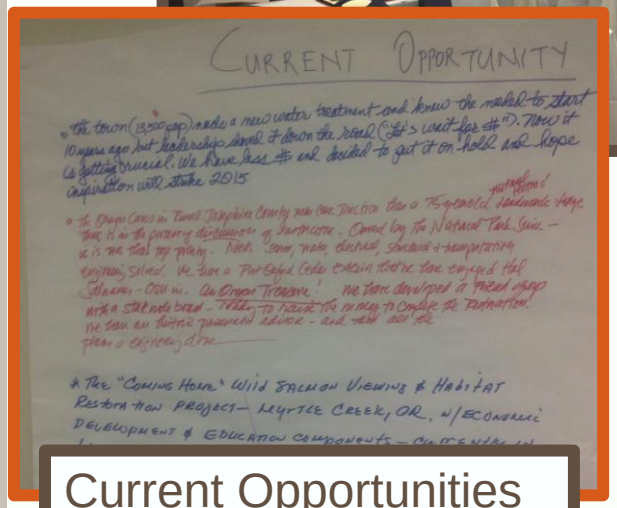
Engagement Roadmap

Regards 2 Rural, June 2013

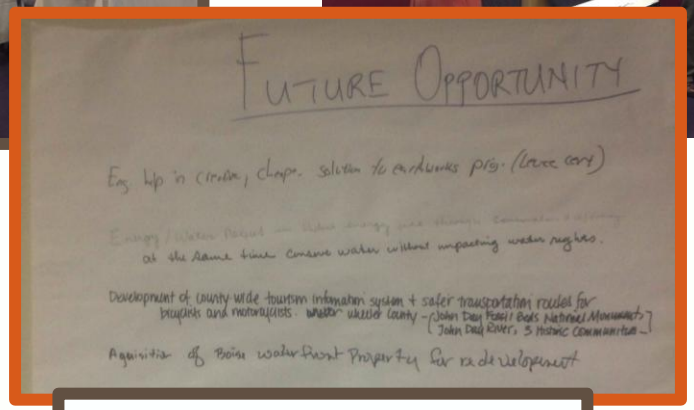


Barriers & Supports





Current Opportunities



Future Opportunities

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Engagement Roadmap

Community and Engineering Resource Identification, August 2013 – January 2014

Community Visit

Senior design team recruitment

Managing expectations

Commitment to listen to “voice of the community”

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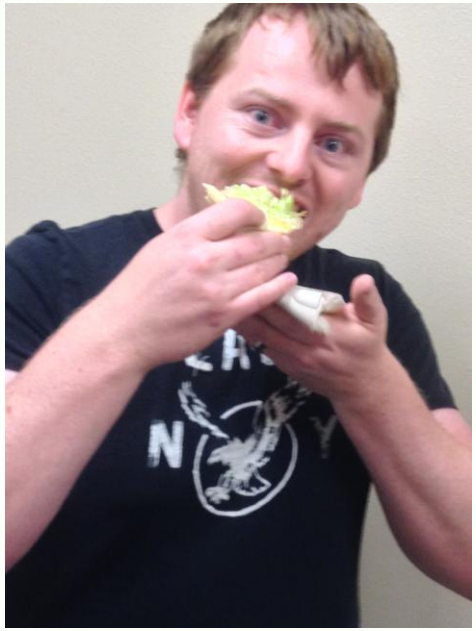
Engagement Roadmap



Conceptual and Detailed Design – Winter & Spring 2014

Ongoing Discussions (in Monroe and Corvallis)

Friday night meetings

Liaison with potential customers (Co-op)

Managing expectations

Commitment to listen to “voice of the community”

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Engagement Roadmap

Implementation & Next Steps - Ongoing

Ongoing Partnership with Del Corazon

Commitment to listen to “voice of the community”

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Next Steps…learning from Del Corazon

- **More CDTII projects:** Applied learning and USDA
- **Cross Disciplinary Graduate Students**: Sociology/Public Policy and Engineering?

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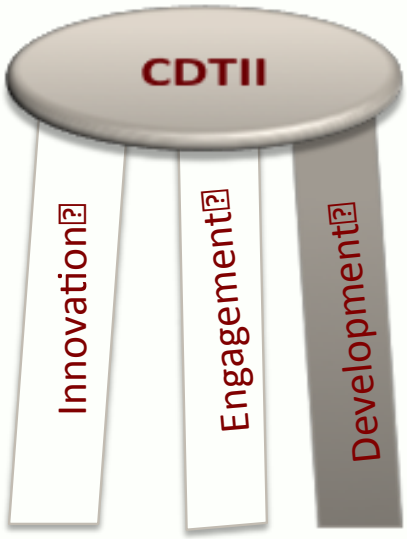
Long Term Partnership



- **Year 1:** Senior Design Teams.
- Engineering Analysis
- Social implications
- Recommendations for implementation
- **Year 2**: Senior Design Teams with OSU labs
- Engineering and social analysis
- Recommendations for implementation or for innovation
- **Year 10**: OSU teams of community students with OSU
- Community problem
- Engineering analysis and design
- Community based start-up company?

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Community-University Relationships
Late 1800's

Industrial revolution

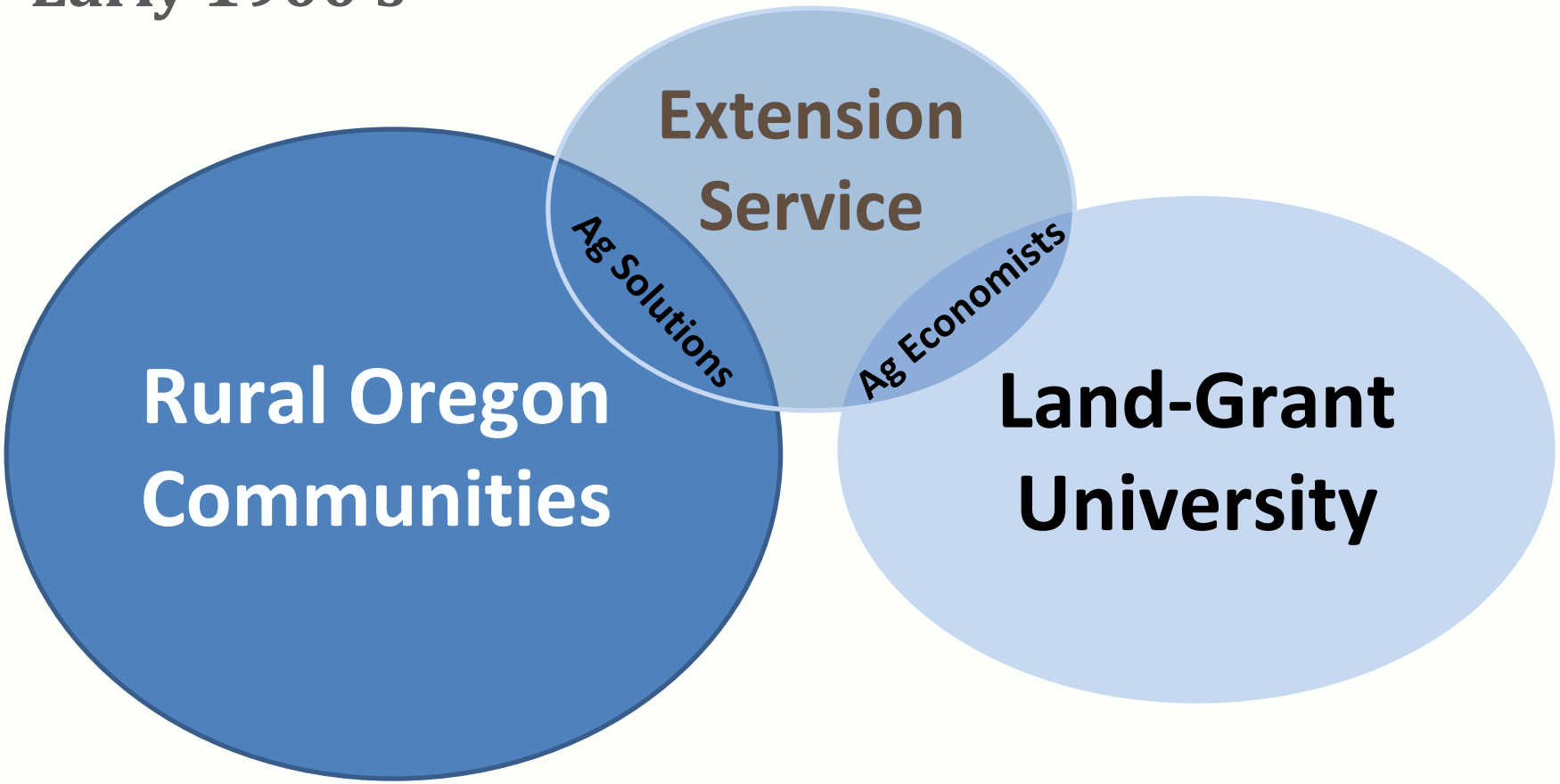
Changing social class

Circa 1862: Teaching of practical agriculture, science, military science and engineering

Circa 1887: Pass along new information, especially … soil minerals and plant growth

Community-University Relationships

Early 1900's



Circa 1914: Cooperative extension — the sending of agents into rural areas to help bring the results of agricultural research to the end users.

The Importance of Customer Participation – Resilience!

Critical Infrastructure Resilience

Increasing demand on aging infrastructure

Top-down *push* versus bottom-up *pull*

Skeptical, sometimes hostile, customer base

Barriers: Infrastructure, value proposition and consumer engagement (Bettencourt, 2014)