Understanding Behavioral and Social Impacts on HVAC Energy Efficiency: Beyond the End User

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The Power of the Middleman

• That **magic moment**
  when an HVAC system is not performing well and it should be replaced with something, hopefully something efficient.
There’s More Than One Middle Man

- Manufacturers
  - Distributors
    - Residential HVAC Contractor
      - Residential Builders/Specifiers
        - Existing Homeowner
        - New Homeowner
    - Commercial HVAC Contractor
      - Commercial Builders
      - Design/Build Contractors
      - New Commercial Owners/Tenants
      - Existing Commercial Owners/Tenants
- Upstream
- Midstream
- Downstream
Residential End Users and Their Thermostats
The technicians and their tools
The End User Meets the Technician
Technician brings in influences from diverse institutions
Who are under other influences themselves...
Each actor or group of actors brings in different sets of knowledge, motivations and beliefs about each other.
Researchers need to understand these
Researchers also need to understand how these affect each other
It gets better!
We just want to tell you, "you have to have this system and you have to pay all this money" and you say "that's not what I'm looking for, you're just trying to sell me on the most expensive thing". It's not what we are trying to push on you. "Are you being honest with me what is the problem and that I really need to replace that part? Or are you asking me to replace that part because it's going to make you money?" "We don't have a way to show efficiency. We just don't. I wish we did. That'd be the biggest no-brainer in the history of mankind, it would make life simple." "There's a lot of people who are looking to be green and it to feel like they are saving the world and what not... some people I want to be net zero, I want to be green... it's like, I can do that..."
Customer Maintenance Behavior Study

- On-Line Random Survey of 268 residential SCE customers
- 4 Focus Groups each with 10 small business owner from SCE territory

- What are customers’ knowledge, beliefs, values, intentions related to HVAC Maintenance?
Understanding Maintenance—Residential Survey: Attributes of AC

![Bar chart showing the attributes of AC.](chart.png)
Understanding Maintenance—Residential Survey: Attributes of AC
Understanding Maintenance—Residential Survey: Attributes of AC

![Bar Chart showing attributes of AC and Refrigerator]

- Air Conditioner
- Refrigerator

(Bad) Good
(Unpleasant) Pleasant
(Harmful) Beneficial
(Worthless) Valuable
(Dangerous) Safe
(Unimportant) Important
(Unnecessary) Necessary
(Inexpensive) Expensive
(Unhealthy) Healthy
(Dirty) Clean
(Ugly) Beautiful
(Environmentally Friendly)
(Low Tech) High Tech
(Wastes Money) Saves Money
(Low Maint) High Maintenance
(Boring) Exciting
(Simple) Complicated
Maintenance Technician Observation Study

- Covertly Observed 13 Maintenance Technicians
- Requested “service,” “maintenance,” and “energy tune-up”.
- Two “faults”:
  - Airflow <250cfm/ton
  - Registers closed
- Post-Observation Interview
Tasks Completed Correctly by Service Duration and Technician Characteristics

- Not Certified, Part, Chain, or Owner
- Certified
- Prog. Part.
- Nat’l Chain
- Owner
Understanding the Role of Middlemen in Emerging Technologies
New Service Models for a New Service

• Quality Maintenance services will take over two hours.

• Adherence to ACCA Standard 4 & 180 or other industry standards for quality workmanship must be mandatory.

• Accurate and well-documented measurements and observations must be the basis for all adjustments and recommendations.

• Technicians must understand the value that they are providing so that they will take pride in this new service and enthusiastically offer it to their customers.
The Key is Customer Acceptance

- Gather **solid data** on the energy- and non-energy benefits.
- Focus on potential “**early adopters**” who already value this technical performance.
- Address the “low-tech” perception by making HVAC servicing as **high-tech** as possible by providing:
  - ACCA Standard Checklist
  - Measurements with expected high/low values
  - Charts, eg, duct leakage as ducts are being sealed
  - Measurements and observations that can be tracked over time.
Thank you! Questions, Comments