

# Public Benefits to A Smoke Alarm Performance Evaluation Scheme

US Consumer Product Safety Commission



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# Interactive Qualifying Project (IQP) from Worcester Polytechnic Institute (WPI)

Based on original research by Everett Baker, Tyler Bennett, Jimmy Mosteller, and John Williams (Worcester Polytechnic Institute)



*Need for a Consumer Focused Smoke Alarm Performance System,*  
Worcester Polytechnic Institute, MA. (December 17th, 2015),

# WPI Student Team's Project Goals

- Assess consumer knowledge & preference.
- Develop consumer information sharing method.
- Evaluate if shared information is effective.

# WPI Student Team's Project Overview

- Background Research
- 1<sup>st</sup> Round of Data Collection
  - Interviews and surveys
- 2<sup>nd</sup> Round of Data Collection
  - Interviews and online surveys
- Conclusions & Recommendations

# WPI Team Smoke Alarm

## Comparison Factors

### Performance Measures

### Convenience Features

- Sensitivity
- Power Source
- Detection Time
- Audibility
- Interconnect ability
- Phone Connectivity
- 10 Year Battery
- Voice Alarms
- Hush Button
- Appearance

# What are Low Involvement Products?

## Low Involvement Product

- Consumable item that entails minimal effort and consideration on the part of the consumer prior to purchase.
- The product does not have a substantial effect on the buyer's lifestyle and hence is not that significant an impact.
- A common product that consumers buy without thinking about it much, often because it is inexpensive, or the one they usually buy.

## Smoke Alarms

- Smoke alarms all basically look the same – white, mainly round.
- Smoke alarms are passive devices that operate in the background. Rare interaction between the consumer and the smoke alarm.
- Smoke alarms are found in 95% of homes and cost as little as \$4.69.

# WPI Student Team:

## What do consumers know?

### Interviews

Interviews are a far more personal form of research than questionnaires or surveys. In the personal interview, the interviewer works directly with the respondent. The interviewer has the opportunity to probe or ask follow-up questions.

[45 in-person interviews ]

### Surveys

Surveys are used to gather data on a topic by asking a large number of people to complete a questionnaire to gain insight into the topic through the answers provided by the respondents.

[360 surveys (241 round 1 and 119 round 2)]

# WPI Student Team Interview Results

Question	Percent “Yes”
...a smoke alarm in your home?	95.6
...purchased a smoke alarm?	44.4
...aware that some smoke alarms respond faster to certain fires?	14.4
...aware of the locations in your home where smoke alarms should be installed?	56.7
...smoke alarm inside or near your kitchen that goes off often?	60.0
...smoke alarm performance rating system influence your [purchase] decision?	93.3

# WPI Student Team Interview Result

## Question 3 – What features would you look for when purchasing a smoke alarm?

### More Frequently Mentioned

- 1) Reliability
- 2) Battery life
- 3) Ease of installation
- 3) Price
- 4) Audibility
- 4) Ease of use
- 4) Hardwire only
- 4) Nuisance resistance
- 5) Battery powered
- 5) Hush button
- 5) Brand

### Less Frequently Mentioned

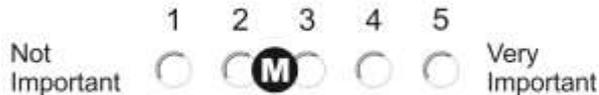
- 8) Sensitivity
- 8) Reviews
- 8) Requirements
- 8) Low battery chirp
- 8) Longevity
- 8) Hush remote
- 8) Hardwire with battery back-up
- 8) Battery removal
- 8) Able to disconnect
- 8) Easily found battery type
- 8) 10-year battery
- 7) Able to interconnect
- 7) Accuracy
- 6) Call in an emergency
- 6) Carbon monoxide
- 6) Aesthetics

Same color and number represents same score

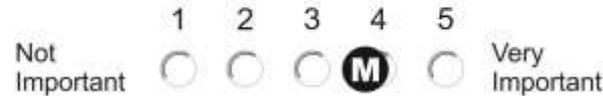
# WPI Team - Survey 1 Results

(241 respondents)

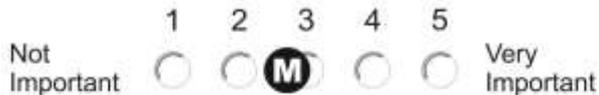
## Size of the alarm



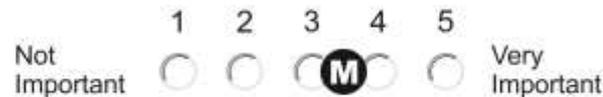
## Importance of a 10 Year Battery



## Aesthetics of the alarm



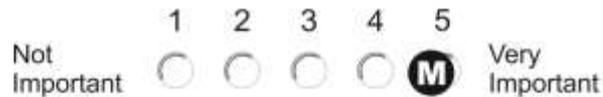
## Price of Alarm



## Voice Alarm



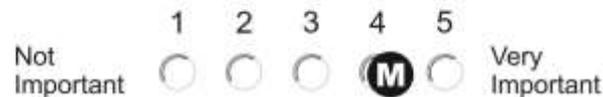
## Detection Time During a Fire



## Option to Interconnect Multiple Alarms



## Resistance to False Alarms



**M** = Mean

# Summary of WPI Data Set

- Respondents want a smoke alarm that works as intended or how they thought it should work (reliable).
- Respondents wanted a smoke alarm that is easy to install and use, and cost effective.
- Most (95%) of the respondents had a smoke alarm but less than half (44%) ever purchased one.
- Less than 15% of the respondents knew different types of smoke alarms respond to different smoke/fires.
- More than half of the respondents (60%) said their smoke alarm sounds from cooking.
- Respondents thought detection and resistance to nuisance sources are important.

# WPI Survey Data Set 2 - Questions

- How will consumers really choose a smoke alarm based on packaging information?
- Does price versus performance affect the decision?
- Are standard icons or text used comprehensible?

# WPI Question1 – Which smoke alarm would be your first choice?



**A**

**B**

**C**

# WPI Question 1 – results

## Which smoke alarm would be your first choice?



- 46.7% selected the smoke alarm with a features list
  - Clear on features (included and missing)
  - More information



- 34.2% selected the smoke alarm with the performance rating system
  - Did not believe rating
  - Clear or unclear graphics
  - Low rating



- 19.2% selected the smoke alarm with the minimum information
  - Missing information
  - Displays included features
  - Less information

## WPI Question 2 – Which smoke alarm are you more likely to buy? (Price difference)



- 93.2% selected the smoke alarm that cost less
  - Better price
  - Looks the same as the costly option



- 6.7% selected the smoke alarm that cost more
  - Cost may indicate better quality
  - Missing features for cost

# WPI Question 3 – Which smoke alarm are you more likely to buy? (Price and performance)



- 16.7% selected the smoke alarm that cost less
  - Price (Item looks the same as the costly unit)
  - No rating context
  - Sufficient – meets the minimum needs



- 83.3% selected the smoke alarm that cost more
  - Better rating
  - Worth the extra cost
  - Rating legitimacy
  - Safety product

# WPI - Do consumers understand the icons used to convey performance ?



Flaming



Smoldering



Nuisance  
Resistance

# WPI Survey 1 (Icons) – Consumers were asked a series of questions



98%



97%



68%

# WPI Survey 2 (Text) – Consumers were asked a series of questions



Sensitivity  
To Flaming  
**96%**

Sensitivity  
to Smoldering  
**95%**

Nuisance  
Resistance  
**75%**

# WPI Observations

Respondents...

- cared about detection time, but do not think about it when purchasing.
- wanted information on performance and will use it when given.
- chose performance over price.
- understood flaming and smoldering, but had a more difficult time with nuisance resistance.
- were unaware that smoke alarms perform differently to different fires.
- experienced frequent nuisance alarms
- have a smoke alarm, but less than half have actually purchased a smoke alarm