Pre-Pilot: Computer Mouse Usage Study

Malena Agyemang

February 16, 2018

Department of Mechanical Engineering,
Clemson University

CEDAR
CLEMSON ENGINEERING DESIGN APPLICATIONS AND RESEARCH

CLEMSON
UNIVERSITY

- Background/Study Purpose
- Research Questions
- Methodology
  - Pre-Pilot
  - Participant Documentation
  - Data Analysis
- Results
- Conclusions
  - Changes
  - Next Steps

Background/Study Purpose

- A pre-pilot computer mouse user study was conducted to further investigate if needs, preferences, and behaviors change once a product is introduced to fit certain needs.

- Participants needs were assessed to see if changes occurred over the course of the study.

Research Questions

- Is one's lifestyle, perceptions, and preferences (persona) considered when looking for products to fulfill a need?

- Are aspects of one's lifestyle, habits, perceptions, and preferences considered by the user when pinpointing their needs after a product is acquired?

- Does the participants' lifestyle, habits, preferences and perceptions change after usage of a product?

- Do new user needs and requirements emerge after usage of a product (mouse)?

- What influences the new needs, if any?

- Was the product rejected/accepted?

- Was there a correlation to mouse rank and study results?

Methodology – Pre-Pilot

1. Gathered **4** participants.

2. Interview each participant with pre-involvement questions.
   - Interview the participants.
   - Install WinOMeter on laptop.
   - Schedule follow-up interview **one week** from interview.

3. Transcribe and code Pre-interview data.

4. Interview each participant with mid-involvement questions.
   - Interview the participants.
   - Download mouse activity history
   - Schedule follow-up interview **three weeks** from interview.

5. Transcribe and code Mid-interview data.

6. Interview each participant with Post-Deployment questions.
   - Interview the participants.
   - Download mouse activity history

7. Final follow up interview with participant.
   - Download mouse activity history post study.
   - Record if abandoned or adopted mouse.

Computer Mice for User Study

Make and Model	Image	Label
Logitech – Trackman Trackball Mouse		**A**
Microsoft Wedge Touch Mouse Surface Edition		**B**
Kensington – Expert Mouse Trackball		**C**
Adesso iMouse E1 – Vertical Ergonomic Illuminated Mouse		**D**
Logitech G502 Proteus Spectrum RGB Turntable Gaming Mouse		**E**
Logitech – M570 Wireless Trackball Mouse		**F**

Table 1: Computer Mice Used in Study

CEDAR
CLEMSON ENGINEERING DESIGN APPLICATIONS AND RESEARCH

CLEMSON
U N I V E R S I T Y

Data Analysis

Transcriptions and Coding

- The interviews coded using the exploratory coding method of hypothesis coding.
- Hypothesis coding was used to uncover if the **perceptions**, **preferences**, and **behaviors** of the participants changed
  - Needs sought for in a computer mouse.
  - Mentions of mouse characteristics for certain daily tasks.
  - Changes in needs sought for in computer mouse

Mouse Activity Data

- Download mouse history.
  - 1 week – pre-mouse
  - 4 weeks – with mouse (mid-study mouse activity data)
  - 1 week – without mouse (post- study mouse activity data)
- For Pre-Pilot:
  - Thur. – Mon. – pre-mouse data
  - 3 weeks – With mouse data

Data Analysis – Coding Definitions

- ## Perception
  - the ability to see, hear, or become aware of something through the senses or a way of regarding, understanding, or interpreting something (Oxford Dictionaries 2017, Dabbagh, N., & Menascé, D. A. 2006)

- ## Preference
  - a greater liking for an alternative over another or others; a thing preferred (Oxford Dictionaries 2017, Hoyle, C. et. al. 2009, Afshari, H.& Peng, Q. 2015)

- ## Behavior
  - consumer actions directly related to the product or actions developed and abandoned because of the product (Alabe, M. 1996, Astra & Reddy, A. K. N. 1982, Madubansi, M. & Shackleton, C. M. 2006)

Coding Sheet

KEY
Preferences
Perceptions
Behaviors

Preferences, Perceptions, and Behaviors									
Participant #				Change Occurance Pre to Mid	Change Occurance Mid to Post	Change Occurance Pre to Post	Number of Needs/Activities /Reasons (Pre)	Number of Needs/Activities /Reasons (Mid)	Number of Needs/Activities /Reasons (Post)
Pre-Involvement Interview	Reason for using mouse and not trackpad	**Mid-Involvement Interview**	Reason for using mouse and not trackpad	**Post-Involvement Interview**	Reason for using mouse and not trackpad				
	Needs and Characteristics when looking for a mouse		Needs and Characteristics when looking for a mouse		Needs and Characteristics when looking for a mouse				
	Reason for purchasing current mouse		Reason for purchasing current mouse		Reason for purchasing current mouse				
	Satisfaction of current mouse		Satisfaction of current mouse		Satisfaction of current mouse				
	Major computer keyboard activities		Major computer keyboard activities		Major computer keyboard activities				
	Major computer mouse activities		Major computer mouse activities		Major computer mouse activities				
	Computer mouse requirements/characteristics wanted to fit participant activities		Computer mouse requirements/characteristics wanted to fit participant activities		Computer mouse requirements/characteristics wanted to fit participant activities				
	Characteristics and aspects you LIKE about study mouse		Characteristics and aspects you LIKE about study mouse		Characteristics and aspects you LIKE about study mouse				
	Characteristics and aspects you DISLIKE about study mouse		Characteristics and aspects you DISLIKE about study mouse		Characteristics and aspects you DISLIKE about study mouse				

CEDAR
CLEMSON ENGINEERING DESIGN APPLICATIONS AND RESEARCH

magyema@g.clemson.edu
http://www.clemson.edu/ces/cedar

CLEMSON
UNIVERSITY

Participant Documentation

		Participant	Name	Alias	Rank (High to Low)	Aspects They Like/Needs (Pre)	Mouse for Study	Length of Study used Mouse	Switched Back to Personal Mouse	Aspects They Like/Needs (Post)
		Participant 1								
	A	Participant 2								
		Participant 3								
	B	Participant 4								
		Participant 5								
		Participant 6								
	C									
	D									
	E									
	F									

CEDAR
CLEMSON ENGINEERING DESIGN APPLICATIONS AND RESEARCH

magyema@g.clemson.edu
http://www.clemson.edu/ces/cedar

CLEMSON
U N I V E R S I T Y

Computer Mouse Distribution

1. **Take the top three mice ranked by the participant.**

2. **Out of the top three mice, choose the mouse that best meets the participants needs based on the form, function, and product description.**

Participant	Rank (High to Low)	Mouse for Study
Participant 1	E, D/B, F, A/C	D
Participant 2	E, D, F, B, A, C	E
Participant 3	D, F, B, C, A, E	F
Participant 4	E, F, A, D, B, C	A

Participant 1 – Coded Data

KEY
Preferences
Perceptions
Behaviors

	Preferences, Perceptions, and Behaviors								Change Occurance Pre to Mid	Change Occurance Mid to Post	Change Occurance Pre to Post
	Participant 1										
Pre-Involvement Interview	Reason for using mouse and not trackpad	Trackpad annoying; Wanted external mouse; Plays games	Mid-Involvement Interview	Reason for using mouse and not trackpad		Post-Involvement Interview	Reason for using mouse and not trackpad	limitiing; can't do customizations to trackpad; mouse has buttons on side	N/A	N/A	Yes
	Needs and Characteristics when looking for a mouse	DPI; Fit in hand; buttons on the side		Needs and Characteristics when looking for a mouse			Needs and Characteristics when looking for a mouse	fits in hand; customimation for buttons; customization for DPI; integration with other stuff(computer accessories); have buttons be harder to press; have buttons at angle	N/A	N/A	Yes
	Reason for purchasing current mouse	Comfort with mouse		Reason for purchasing current mouse			Reason for purchasing current mouse		N/A	N/A	N/A
	Satisfaction of current mouse	Satisfied		Satisfaction of current mouse			Satisfaction of current mouse	Satisfied; likely to purshase a mouse similar if sensitivy could be customized	N/A	N/A	N/A
	Major computer keyboard activities			Major computer keyboard activities			Major computer keyboard activities	Word; Web browsing; Excel; Matlab	N/A	N/A	N/A
	Major computer mouse activities	Gaming; Word; Excel; Watching videos; Internet; Solidworks; Research videos		Major computer mouse activities			Major computer mouse activities	Web Browing; Youtube; Gaming; Reading Reddit	N/A	N/A	Yes
	Computer mouse requirements/characteristics wanted to fit participant activities	how sits in hand		Computer mouse requirements/characteristics wanted to fit participant activities			Computer mouse requirements/characteristics wanted to fit participant activities	fit in hand because hand resting all day	N/A	N/A	No
	Characteristics and aspects you *LIKE* about study mouse	how sits in hand		Characteristics and aspects you *LIKE* about study mouse	different; ergonomic; intuitive to use		Characteristics and aspects you *LIKE* about study mouse	Good fit for hand; took less effort to keep fingers from pressing buttons; different; comfortable; fit mouse needs	No	Yes	No
	Characteristics and aspects you *DISLIKE* about study mouse			Characteristics and aspects you *DISLIKE* about study mouse	not the same as current mouse; will have to get used to mouse		Characteristics and aspects you *DISLIKE* about study mouse	slow; not having a driver package to customize sensitivity	N/A	Yes	N/A

magyema@g.clemson.edu
http://www.clemson.edu/ces/cedar

CEDAR
CLEMSON ENGINEERING DESIGN APPLICATIONS AND RESEARCH

CLEMSON
UNIVERSITY

Participant 1 – Needs Assessment

Coded Post-Deployment Interview Responses for Participant 1. Perceptions are in bold, preferences are in italics, and behaviors are underlined.

Parameter	Response
Reason for using an external mouse and not the trackpad	*Can't do customization to trackpad; mouse had buttons on side;* **Limiting**
Needs and characteristics when looking for a mouse	*Fits in hand; customization for DPI; Integration with other computer accessories; Have buttons be harder to press; Have buttons at angle*
Computer mouse requirements/characteristics wanted to fir participants activities	*Fit in hand;* Hand resting all day

magyema@g.clemson.edu
http://www.clemson.edu/ces/cedar

CEDAR
CLEMSON ENGINEERING DESIGN APPLICATIONS AND RESEARCH

CLEMSON
UNIVERSITY

Results Summary/Conclusion

Changes in Needs - Participant's Needs Pre- and Post-Study. Perceptions are in bold, preferences are in italics, and behaviors are underlined.

	Aspects They Like/Need (Pre)	Aspects They Like/Need (Post)
Participant 1	*DPI; Fit in hand curve; Buttons*	*Fits in hand; customization for buttons; Customization for DPI; Integration with other stuff (computer accessories); Have buttons on be harder to press; Have buttons at angle*
Participant 2	*How many buttons; size; Comfort;* <u>*Gaming*</u>	*Look; How many buttons; performance*
Participant 3	*Wireless; No Bluetooth; Small;* <u>*Easy to carry*</u>	*Small;* <u>*Easy to carry;*</u> *wireless; Last long; Use on any surface*
Participant 4	*Noise free; Smooth while clicking; Bluetooth and mouse must be in sync; Shape of mouse handy*	*Not too fast or too slow; Noise free*

magyema@g.clemson.edu
http://www.clemson.edu/ces/cedar

CEDAR
CLEMSON ENGINEERING DESIGN APPLICATIONS AND RESEARCH

CLEMSON
UNIVERSITY

Results Summary/Conclusion

Changes in Needs - Coded Participant Responses to Study Mouse Mid- and Post-Involvement. Perceptions are in bold, preferences are in italics, and behaviors are underlined.

	Characteristics They Like About Study Mouse (Mid)	Characteristics They Like About Study Mouse (Post)
Participant 1	**Different; ergonomic; Intuitive to use**	*Good fit for hand;* **Took less effort to keep fingers from pressing buttons; different; Comfortable; fit mouse needs**
Participant 2	*Number of buttons;* **Look of the mouse; Feels comfortable in hand**	*Change the weight;* ***the look;*** **Buttons not hard to put fingers on;** *Durable wire on study mouse*
Participant 3	**Wireless; Position of hand**	**Use on any surface**
Participant 4	**Handy; Easy to use**	**Idea of trackball**

CEDAR
CLEMSON ENGINEERING DESIGN APPLICATIONS AND RESEARCH

CLEMSON
UNIVERSITY

Results Summary/Conclusion

Changes in Needs - Coded Participant Responses to Study Mouse Mid- and Post-Involvement. Perceptions are in bold, preferences are in italics, and behaviors are underlined.

	Characteristics They Dislike About Study Mouse (Mid)	Characteristics They Dislike About Study Mouse (Post)
Participant 1	**Not the same as current mouse; Will have to get used to mouse**	**Slow; Not having a driver package to customize sensitivity**
Participant 2	Doesn't know	**Lighting feature when push button on mouse**
Participant 3	**Trackball**	**Really big; Position of hand on mouse was different**
Participant 4	**Trackball to big**	**Heavy; Makes lots of sound**

CEDAR
CLEMSON ENGINEERING DESIGN APPLICATIONS AND RESEARCH

CLEMSON
UNIVERSITY

Results Summary/Conclusion

- ## Changes in needs – Quantity

	Reason for Using Mouse and not Trackpad			Needs and Characteristics when Looking for a mouse			Length of Study Used Mouse
	Change Occurrence	Number of Needs (Pre)	Number of Needs (Post)	Change Occurrence	Number of Needs (Pre)	Number of Needs (Post)	
Participant 1	Yes	3	3	Yes	3	6	Full
Participant 2	Yes	1	1	Yes	3	3	Full
Participant 3	Yes	1	1	Yes	4	5	Full
Participant 4	No	2	3	Yes	5	2	Partial

CEDAR
CLEMSON ENGINEERING DESIGN APPLICATIONS AND RESEARCH

magyema@g.clemson.edu
http://www.clemson.edu/ces/cedar

CLEMSON
UNIVERSITY

Results Summary/Conclusion

- Changes in behavior – ratio of averages for Participant 1's computer activity

Parameter	Pre-Involvement	Mid-Involvement (Study Period)
Days/Period	1	13
Left:Total (%)	24.39	33.60
Right:Total (%)	2.92	32.25
Middle:Total (%)	72.69	63.72
Left:Right (%)	89.32	88.89
Right:Middle (%)	3.86	5.65
Left:Middle (%)	25.12	33.60

Changes and Next Steps

- Run Pilot Study
- Run Larger Study
- Take advantage of open interview questions to find out why participants do not have the same needs from previous design stages
- Look for trends in changes and pinpoint factors that may influence change.

Methodology – Changes

1. Gather **6** participants per study and **6** participants per control study.
2. Interview each participant with pre-involvement questions. During the interview:
   - Interview the participants.
   - Install WinOMeter on laptop.
   - Schedule follow-up interview **two weeks** from interview.
3. Transcribe and code Pre-interview data.
4. Interview each participant with mid-involvement questions. During the interview:
   - Interview the participants.
   - Download mouse activity history
   - Schedule follow-up interview **four weeks** from interview.
5. Transcribe and code Mid-interview data.
6. Interview each participant with Post-Deployment questions. During the interview:
   - Interview the participants.
   - Download mouse activity history
   - Schedule follow-up interview **two weeks** from interview.
7. Transcribe and code Post-Deployment interview data.
8. Final follow up interview with participant.
   - Download mouse activity history post study.
   - Record if abandoned or adopted mouse.

magyema@g.clemson.edu
http://www.clemson.edu/ces/cedar

		Participant	Name	Alias	Rank (High to Low)	Aspects They Like/Needs (Pre)	Mouse for Study	Length of Study used Mouse	Switched Back to Personal Mouse	Continue Use of Study Mouse	Aspects They Like/Needs (Post)
	A	Participant 1									
		Participant 2									
		Participant 3									
	B	Participant 4									
		Participant 5									
	C	Participant 6									
	D										
	E										
	F										

Thank You For Your Attention

Questions ?

References

- Dictionaries, O., 2017, "Preference," Oxford Dictionaries [Online]. Available: en.oxforddictionaries.com/definition/preference.

- Hoyle, C., Chen, W., Ankenman, B., and Wang, N., 2009, "Optimal Experimental Design of Human Appraisals for Modeling Consumer Preferences in Engineering Design," J. Mech. Des., 131(7), p. 71008.

- Afshari, H., and Peng, Q., 2015, "Modeling and Quantifying Uncertainty in the Product Design Phase for Effects of User Preference Changes," Ind. Manag. Data Syst., 115(9), pp. 1637–1665.

- Dabbagh, N., and Menascé, D. A., 2006, "Student Perceptions of Engineering Entrepreneurship: An Exploratory Study," J. Eng. Educ., 95(2), pp. 153–164.

- Dictionaries, O., 2017, "Perception," Oxford Dictionaries [Online]. Available: en.oxforddictionaries.com/definition/perception. [Accessed: 20-Jul-2010].

- Alabe, M., 1996, "Household Energy Consumption Patterns in Northern Nigeria," Energy Sustain. Dev., **2**(5), pp. 42–45.

- Astra, and Reddy, A. K. N., 1982, "Rural Energy Consumption Patterns — A Field Study," Biomass, **2**, pp. 255–280.

- Madubansi, M., and Shackleton, C. M., 2006, "Changing Energy Profiles and Consumption Patterns Following Electrification in Five Rural Villages, South Africa," Energy Policy, **34**, pp. 4081–4092.