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A Card-Sorting Study for the History of the Census Bureau: "Sights and Sounds: Photos" Web Page

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ABSTRACT
In July and August 2009, the U.S. Census Bureau's Statistical Research Division (SRD) conducted a card-sorting study to evaluate how participants organize various photographs that will be on a new sub-page of the History of the Census Web site, "Sights and Sounds: Photos." The new sub-page is currently under development and will contain historical photos of the Census Bureau. The new page is expected to go live in October 2009. The card-sorting study evaluated the groupings created by 23 participants, ranging in age from 13 to 74. Participants sorted 121 cards and labeled them with terminology that made sense to them. Results revealed common groupings, as well as photos that were problematic and difficult to sort. Findings were provided to the sponsor and team responses were received. This report provides a complete summary of the card-sorting evaluation, including methods and findings.

Executive Summary

In July and August 2009, the U.S. Census Bureau's Statistical Research Division (SRD) usability staff conducted a card-sorting study to evaluate how participants organize various photographs that will be on a new sub-page of the History section of the Census Web site called "Sights and Sounds: Photos." Twenty-three participants sorted 121 cards into piles that made sense to them and labeled each pile. This study evaluated the different card groupings in order to find common groupings that could be used for the Web site. Testing took place at the Census Bureau's Usability Laboratory in Suitland, MD.

Purpose. The primary purpose of this card-sorting study was to get user feedback on the way in which items should be grouped together. A secondary purpose was to gather user feedback on the names of the groupings and to obtain user feedback on the textual descriptions accompanying each photo.

Method. Twenty-three people participated in the study. Five people were high-school age students (13-15 years old), eight were college-age students (19-27 years old), five were middle-age adults (30-54 years old), and five were older adults (60-65 years old). High-school students, college-age students, and retired older adults have been identified by the ACSD History staff as typical users of the History Web site. These groups usually access the site for research and genealogy projects. Middle-age adults are considered casual users, as they typically access the site recreationally.

Participants were given 121 cards. Each card contained a photograph and a caption explaining the photo. Participants sorted the cards and were asked to verbalize what they were thinking about during the session. For example, participants were encouraged to voice questions or opinions about the cards and why they selected a certain pile in which to place them. If at any time the participant became quiet, the test administrator reminded the participant to think aloud. After the participant completed the card-sorting task, the test administrator asked the participant to label each pile in a way that made sense to them and then to describe their naming criterion. Upon completion, the participant answered debriefing questions. Overall, each card-sorting session lasted about 90 minutes.

Results. The full report provides complete descriptions of findings, recommendations, and team responses. The following are highlights of the findings: There were some clear groupings, in that most participants often grouped certain cards together. To name each grouping, the Usability Team examined the labels that participants gave to each of their groupings. The Usability Team narrowed down the list of labels by selecting frequently occurring terms that fit well with the clusters and that made sense for the Web site. Some user-derived terms were noted that would not be suitable for novice users and likely were chosen based on the text that was displayed with the photographs. Participants wanted to see photos grouped chronologically, and they wanted to see more recent photos. Participants reported that they found portraits, buildings, enumeration, and promotional materials easy to sort and machines and computers difficult to sort. Participants reported that they found some images difficult to sort because they did not seem to belong with the other images, and some terminology was identified as difficult to understand.

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A Card-Sorting Study for the History of the Census Bureau: "Sights and Sounds: Photos" Web Page

1.0 Introduction

The organizational structure of a Web site is an important element that helps to ensure that the site is easy for people to use. Web-site users must be able to navigate freely and confidently through a site in order to find information successfully and efficiently. One approach to gaining user input regarding the organization of information on a Web site involves conducting a card-sorting study. In a card-sorting study, participants sort terms or items into piles as they see fit (Olmsted-Hawala, 2008). In using this technique, we are able to learn the mapping between the user conceptual model and the information displayed on an interface (Nielsen, 1993). The design of the current study will allow us to gain user feedback on how content of the History: "Sights and Sounds: Photos" Web page should be organized by having typical users sort photographs into piles that make sense to them.

1.1 Background

A new sub-page of the History of the Census Bureau Web site is currently under development. The page, "Sights and Sounds," will contain historical photos, audio, and video of the Census Bureau. Developers plan to create a tabbed link on the far right of the top navigation bar on the existing Census Bureau History Web site (http://www.census.gov/history/) for the "Sights and Sounds" Web page. See Figure 1. This study is specifically concerned with the Photos section of the "Sights and Sounds" page. In addition to a Photos sub-page linked to the "Sights and Sounds" page, there will also be an Images sub-page and an Audio sub-page. This study is not concerned with these two pages. The "Sights and Sounds" Web page is expected to become live on the Internet in October 2009.

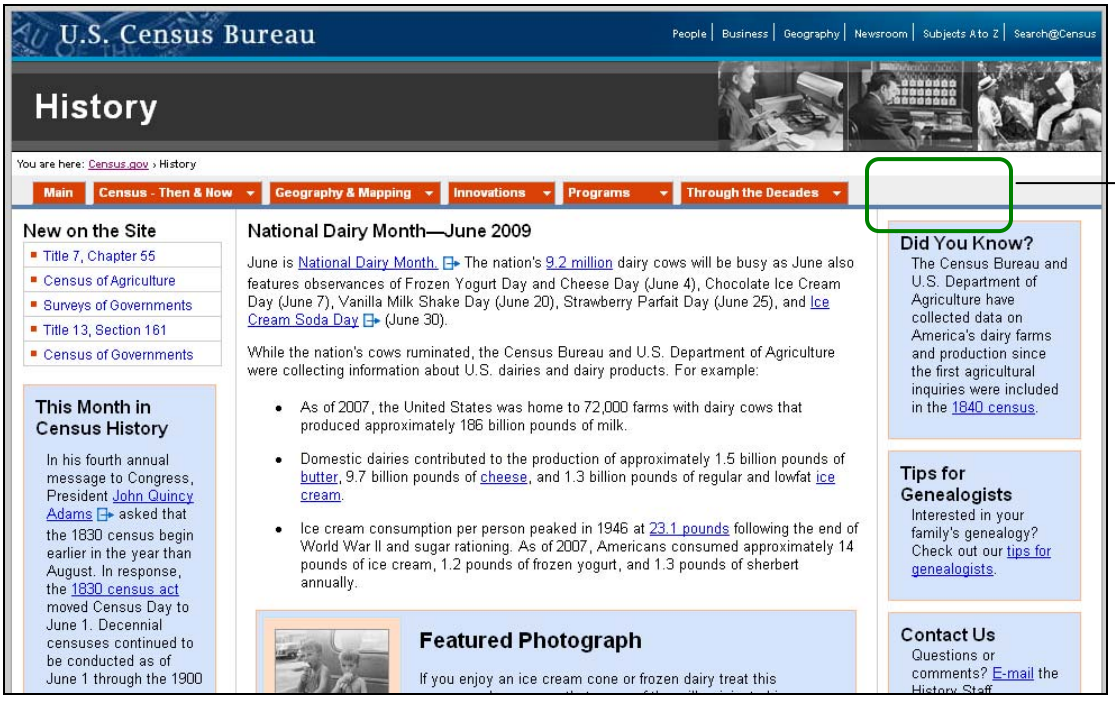

Figure 1. Current Census Bureau History Web site with highlighted area for the new "Sights and Sounds" tab

This card-sorting study evaluated how participants organized various photographs that will be used on the Web page. Some examples of photographs that were sorted and will be used on the Web page are photos of Census enumerators, Census equipment, advertisements, buttons and name badges worn by Census employees, and screen shots from movies that featured Census enumerators. Photographs had a few lines of text describing what was depicted. See Figure 2 for an example of one of the cards. See Appendix A for a full listing of the cards. Participants sorted cards into piles that made sense to them. In addition, participants labeled each pile.

Figure 2. Example of card that participants sorted in the card-sorting study.

The History Staff determined that when the site initially goes live, each photo category will contain approximately 20 photos. Over time, new photos will be added to each category. When a pre-determined maximum number of photos in each category has been reached, new photos will be cycled in at regular time intervals to replace older photographs.

This card-sorting study took place at the Census Bureau's Usability Lab from July 23 to August 26, 2009, and a quick report was submitted to the Administrative and Customer Services Division (ACSD) History staff on September 11, 2009. Members of the ACSD History staff and the Usability Team met on September 22, 2009 to discuss the results of this card-sorting study.

1.2 Purpose

The primary purpose of this card-sorting study was to get user feedback on the way in which items should be grouped together. A secondary purpose was to gather user feedback on the names of the groupings as participants were asked to label the groups of items with labels that made sense to them. These labels will inform the designer of category labels that fit the users' mental models. Mental models are a user's constructed representation of events, people, and things in the world based on knowledge and experience. A third purpose was to obtain user feedback on the textual descriptions accompanying each photo.

2.0 Method

2.1 Participants and Observers

Twenty-three people participated in the study. Five people were high-school students, eight were college-age students, five were middle-age adults, and five were older adults. Six college-age students and one middle-age adult were Statistical Research Division (SRD) employees; the high-school students were children of SRD employees, and all other participants were recruited externally through a database maintained by the Usability Lab. High-school students,

college-age students, and retired older adults have been identified by the ACSD History staff as typical users of the History Web site, as these groups access the site for research and genealogy projects. Middle-age adults are considered casual users because they typically access the site recreationally.

Both typical (expert) and casual (novice) users were tested, as studies have shown that experts organize information differently from novices, such that experts organize in a domain-relevant manner, whereas novices organize based on similarity among items (Allwood, 1986; Chi & Koeske, 1983; Fincher & Tenenberg, 2005; Lakoff, 1987; Maiden & Hare, 1998; McKeithen, Reitman, Reuter, & Hirtle, 1981). While it is important for items to be organized in a way that makes sense to people who use the History Web site often, it is equally important to make the site usable for novices who are new to the site.

The mean age across all participants was 33.8 years (range 13-74). For high school students, the mean age was 14.6 years (range 13-17); for college students, it was 23.1 years (range 19-27); for middle-age adults, it was 39.2 years (range 30-54); for older adults, it was 64.6 years (range 60-74). Participants' education levels ranged from high school education to doctoral degrees. Participants were diverse in race, ethnicity, and gender. See Table 1 for all participants' demographic information and Table 2 for demographics by age group. All participants reported having experience using computers and the Internet, and all were unfamiliar with the History of the Census Web site. See Table 3 for participants' self-reported computer and Internet experience.

2.2 Assumptions

- Participants had at least one year of prior Internet and computer experience.
- Participants had prior knowledge of how to navigate a Web site.
- Participants did not have prior experience with the History of the Census Bureau Web site.
- All participants had no known disabilities.

Table 1. All Participant Demographics

Gender	N	Age range	N	Education	N	Race	N
Male	11	≤ 20	6	Currently in HS	4	African American	7
Female	12	21-29	7	HS, GED	2	Asian	4
		30-45	3	Some college, AA	5	White	12
		46-60	3	Bachelor's	7		
		61+	4	Master's +	5		
Mean across all participants		**35.08 years**					

Table 2. Participant Demographics by Age Group

Gender	N	Age	N	Education	N	Race	N
High school participants							
Male	3	13	1	Grade 8	1	White	5
Female	2	14-15	2	Grade 9	3		
		17	1	Grade 12	1		
Mean across high-school participants		**14.6 years***					
College-aged participants							
Male	3	19	1	HS, GED	0	African American	2
Female	5	22-23	4	Some college, AA	1	Asian	4
		24-25	2	Bachelor's	5	White	2
		27	1	Master's +	2		
Mean across college-aged participants		**23.1 years***					
Middle-aged participants							
Male	3	30	2	HS, GED	0	African American	2
Female	2	36	1	Some college, AA	2	White	3
		46	1	Bachelor's	1		
		54	1	Master's +	2		
Mean across middle-aged participants		**39.2 years***					
Older participants							
Male	2	60-61	2	HS, GED 1		African American	3
Female	3	63-65	2	Some college, AA	2	White	2
		74	1	Bachelor's	1		
				Master's +	1		
Mean across older participants		**64.6 years***					
Mean across all participants		**35.08 years***					

*The mean age was calculated from the exact values for each participant. The exact self-reported values were placed in ranges in Table 1 to help the reader get an overview of the data.

Table 3. Participants' Self-Reported Computer-and-Internet Experience

		Scale: 1 (no experience) – 9 (very experienced)		Scale: 1 (not comfortable) – 5 (comfortable)			Scale: 1 (never) – 5 (very often)			Scale: 1 (not familiar at all) – 5 (very familiar)	
Participant	Hours per day on the Internet	Overall experience with computers (1-9)	Overall experience with Internet (1-9)	Comfort in learning new Web sites (1-5)	Comfort in manipulating a window (1-5)	Comfort in using and navigating the Internet (1-5)	How often working with data through a computer (1-5)	How often working with complex analyses of data through a computer (1-5)	How often using the Internet or Web sites to find information (1-5)	How familiar with the Census Web site (location, tools, data, etc.) (1-5)	How familiar with the History of the Census Web site (1-5)
6	4-6	7	7	4	5	5	3	2	5	2	1
7	1-3	3.5	6	5	5	5	1	1	5	2.5	1
8	1-3	9	9	5	5	5	3	1	5	2	1
10	1-3	7	7	4	5	4	4	3	3	2	2
14	1-3	6	7	5	4	5	5	4	5	3	1
Average for HS students		**6.50**	**7.20**	**4.60**	**4.80**	**4.80**	**3.20**	**2.20**	**4.60**	**2.30**	**1.20**
21	7+	7	7	5	5	5	5	3	5	2	1
22	7+	9	9	5	5	5	5	5	5	5	5
23	7+	9	9	5	5	5	5	5	5	3	1
1	1-3	6	9	5	5	5	5	3	5	3	3
3	1-3	7	8	4	5	5	3	1	4	3	1
4	4-6	7	8	5	5	5	5	3	5	5	1
11	1-3	9	8	4	5	5	4	1	5	4	1
12	4-6	9	9	5	5	5	5	4	5	4	2
Average for college students		**7.88**	**8.38**	**4.75**	**5.00**	**5.00**	**4.63**	**3.13**	**4.88**	**3.63**	**1.88**
2	4-6	9	9	4	4	5	5	5	5	5	5
9	1-3	7	7	5	5	5	4	3	4	3	1
16	1-3	7	7	4	5	5	5	3	5	4	2
17	1-3	7	7	4	4	4	3	3	3	3	3
19	4-6	8	8	5	5	5	5	3	4	3	2
Average for middle-age		**7.60**	**7.60**	**4.40**	**4.60**	**4.80**	**4.40**	**3.40**	**4.20**	**3.60**	**2.60**
5	1-3	6	8	5	4	4	4	2	5	2	1
13	1-3	5	6	4	3	3	4	1	4	2	2
15	1-3	8	7	5	5	4	5	2	4	4	2
18	7+	8	8	5	5	5	3	1	5	5	3
20	4-6	6	7	5	5	5	3	2	4	3	2
Average for older adults		**6.60**	**7.20**	**4.80**	**4.40**	**4.20**	**3.80**	**1.60**	**4.40**	**3.20**	**2.00**
Average across all participants		**7.24**	**7.70**	**4.65**	**4.74**	**4.74**	**4.09**	**2.65**	**4.57**	**3.24**	**1.91**

2.3 Facilities

Testing took place in room 5K416 at the U.S. Census Bureau in Suitland, MD. Each participant separately sorted the cards into piles at a large table in a room with a wall camera and an audio recorder. The test administrator was in the room with the participant. An ACSD History staff observer watched some of the sessions through a live feed shown on a television.

2.4 Materials

2.4.1 General Introduction

The test administrator read background material and explained key points about the session. See Appendix B.

2.4.2 Consent Form

Prior to beginning the card-sorting study, participants completed a consent form that informed them that they would be audio taped. See Appendix C.

2.4.3 Questionnaire on Computer-and-Internet Experience

Prior to card sorting, the participant completed a questionnaire on his or her computer use and Internet experience. See Appendix D.

2.4.4 Debriefing Questions

After sorting all cards and labeling each pile, the participant answered debriefing questions about his/her experience sorting the cards. See Appendix E.

2.4.5 Cards

The History team provided a set of 121 cards that included a variety of photos from all areas (people, technology, advertisements, etc.). Photographs were digitally enlarged and printed on 8" x 11" card-stock paper. A short description of the photograph was included on each card. The test administrator semi-randomized the card set before the beginning of each card-sorting session by "shuffling" them. The back of each card held a unique identification number.

2.5 Procedure

Following security procedures, individual participants reported to the visitor's entrance at the U.S. Census Bureau Headquarters and were escorted to room 5K416. Upon arriving, each participant was seated in the study room. The test administrator greeted the participant and read the general introduction. Next, the participant read and signed the consent form. After signing the consent form and doing a practice task that involved sorting fruits and vegetables and labeling the piles, the participant completed the questionnaire on computer use and Internet experience. Upon completion of the questionnaire, the participant sorted the cards.

The test administrator gave the participants a stack of 121 cards and asked them to sort the cards into piles that made sense to them. Participants were encouraged to create as many or as few piles as they desired in order to observe what participants would do without constraints. If it became clear that participants were creating fewer than five categories or more than 15 categories, the test administrator advised the participants to break up or consolidate their categories because categories that were either too specific or too broad would likely not yield meaningful categories for the "Sights and Sounds" Web site. Once the participant finalized their card categories, the test administrator asked the participant to label each category with sticky

notes. Participants were free to create, remove, and modify categories as needed during sorting and labeling.

While sorting the cards, participants were encouraged to think aloud, that is, to verbalize what they were thinking about during the session. For example, the participants were encouraged to voice questions or opinions about the cards and why they selected a certain pile to place them in. The participant's narrative allowed us to gain a greater understanding of how they sort and to identify issues with any of the cards. If at any time the participant became quiet, the test administrator reminded the participant to think aloud. During the session, the test administrator noted any behaviors that indicated confusion, such as hesitation, backtracking and frowning. After the participant completed the card-sorting task, the test administrator asked the participant to label each pile in a way that made sense to them and then to explain their naming criterion. Upon completion, the participant answered the debriefing questions. This was an opportunity for a conversational exchange wherein the test administrator remained neutral. At the conclusion of the debriefing, the audio recording was stopped. Overall, each card-sorting session lasted about 90 minutes.

Observers from the ACSD History staff were invited to watch the card-sorting studies through a live video feed shown on a television from a separate room, apart from the participant and test administrator. At the end of each session, the test administrator and observer discussed the findings from that session and compared them to findings from other sessions.

3.0 Data Analysis

Data from each participant's card sort was subjected to cluster analyses that showed which items were more often put together by the users, and how close or far apart they were (Rau & Liang, 2003). A full listing of the cards tested in this study can be found in Appendix A. Twenty-one images (10, 11, 12, 13, 14, 17, 18, 19, 20, 37, 38, 46, 47, 48, 49, 50, 51, 52, 53, 54, and 57) were excluded from the cluster analysis due to limitations of the software (the program could only analyze 100 cards at a time). These photographs were chosen for exclusion based on the tendency of the majority of participants to group these images similarly. Photographs 10-20 were of promotional posters, photographs 46-57 were of Census Bureau buildings and land, and photographs 37 and 38 were portraits. Nearly all participants created these categories and frequently placed the same representative set of photographs in each of the categories. All but three participants grouped the promotional posters with images of buttons (cards 15 and 16). One building picture was included in the analysis (55, Emery 1900-1920) and was often grouped with the other building pictures. Two director portraits (39, director portrait 1850; 42, assistant director, 1921) were included in the analysis and were often grouped with the other portraits in the analysis.

Cluster analysis is a statistical procedure that is often used to measure similarity and develop a classification of items. The goal of the analysis, as it applies to card sorting, is to reach a better understanding of the groupings that users make with the terms (or in this case, with the photos). For the analysis, we used IBM's free software U-Sort (to enter data) and EZ-Calc (to analyze data). EZ-Calc produced aggregate groupings across participants in the form of a hierarchical tree structure, or dendrogram. A dendrogram incorporating all participants' groupings is shown in Figure 1. The Usability Team reviewed the dendrogram to identify clusters of photographs that were frequently grouped together.

EZ-Calc creates dendrograms (tree diagrams) using three analysis algorithms: Complete, Single, and Average. The Single algorithm emphasizes similarities, the Complete algorithm emphasizes differences, and the Average algorithm creates "balanced" dendrograms. Our

analysis uses the Average algorithm. The dendrograms graphically depict how "similar" cards are to each other based on participant groupings. Cards are considered similar if they are often grouped into the same category by participants, and cards are considered dissimilar if they are often grouped into different categories by participants. The x-axis of the dendrograms show how distant or dissimilar cards are from each other. Cards with a distance of 0 were placed in the same category by all participants. Cards with a distance of 1 were not placed in the same category by any participant. Cards with a distance of 0.20 were grouped together by roughly 80% of the participants (Wisman, 2006).

4.0 Results Based on the Card Sorting

Results from the card-sorting study are discussed below. We present the qualitative data, and possible future directions based on the ACSD History staff's responses to the findings.

4.1 Participant Groupings

There were some clear groupings, in that most participants grouped certain cards together all the time. These cards are connected by very short lines on the dendrogram. Some other cards were sorted together less frequently and are connected by longer lines on the dendrogram.

Participants tended to group the following photographs together (see Figure 3 or Appendix F for a larger view of the dendrogram):

- Enumerators and interviews
- Executives and directors
- People creating maps and verifying data
- People working with machinery
- People preparing for the Census
- Machines (without people in the photographs)
- Tabulating data

To highlight what the dendogram looks like close-up, Figure 3 displays a call out of the grouping 'People Preparing for the Census'.

To name each grouping, the Usability Team examined the labels that participants gave to each of their groupings. The Usability Team narrowed down the list of labels by selecting frequently occurring terms that aptly describe the photographs in each dendrogram cluster and that made sense for the Web site. Some terms that occurred numerous times either as a single label or within a longer label name were "building," "employees," "enumerators," "interviews," "machines," "promote," "data," and "people."

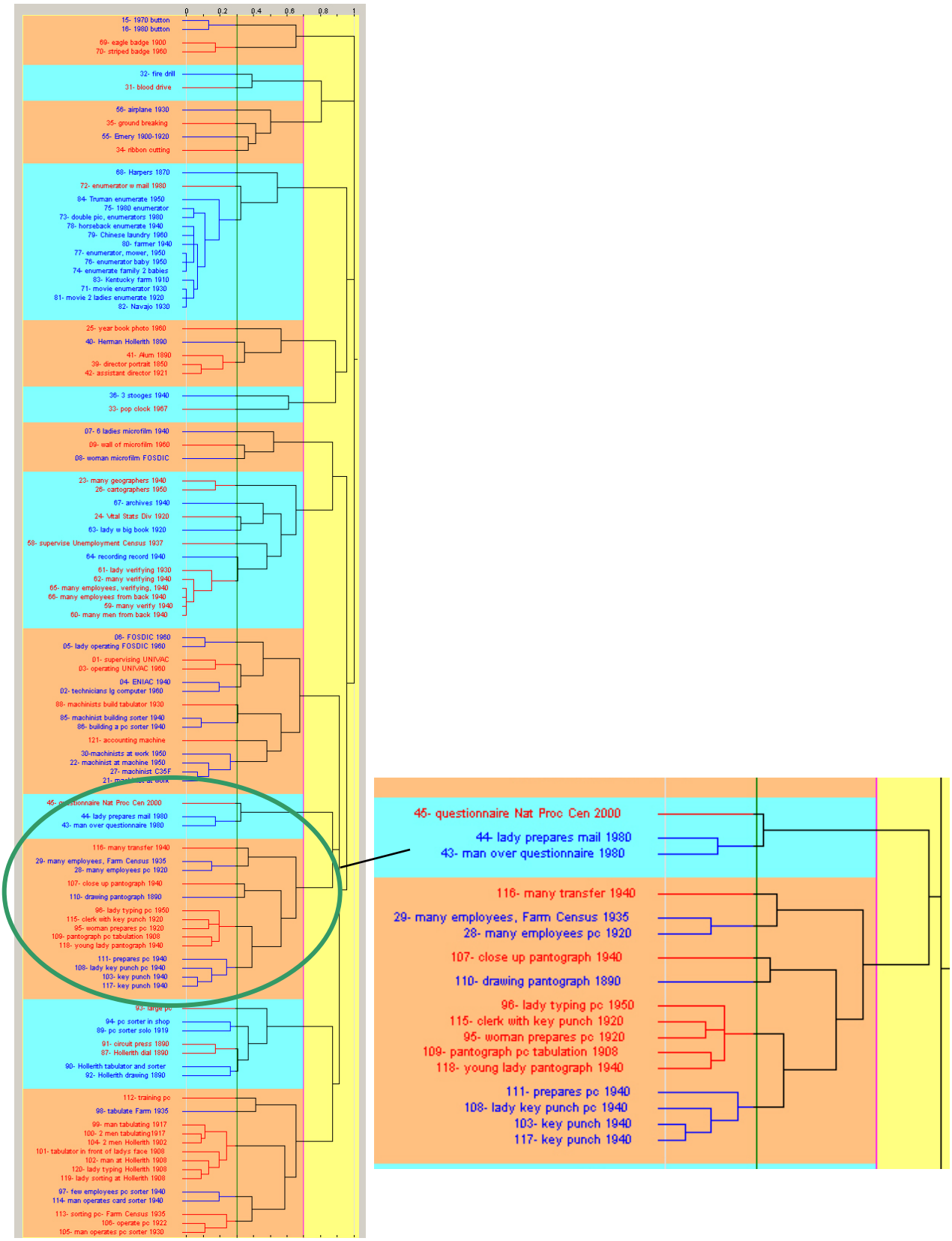

Figure 3. Dendrogram for all participants, with a close-up of an example of a grouping: 'Preparing for the Census.' Distance of 0 = similar photographs, distance of 1 = dissimilar photographs.

Possible Future Naming Labels: Possible group naming labels include the following:

- Promotions
- Buildings
- Census Takers/Interviews
- Executives
- People at Work
- Checking Data/Creating Maps
- People at Work: With Machines
- People at Work: Preparing for the Census
- Machines; Tallying Data

See Appendix F to see how these labels can be applied to the user groupings.

Some user-derived terms would not be suitable for novice users and were likely chosen based on the text that was displayed with the photographs. Terms we identified as Census jargon and unsuitable for new visitors to the Web site include:

- Tabulating
- Verifying
- Punch card
- Hollerith
- Microfilm
- Enumerate

Team Response: Most of the categories will be used on the Web site. The categories "People at Work," "People at Work: With Machines," and "People at Work: Preparing for the Census" will likely be condensed into "People at Work." A thumbnail of a representative picture from each category will be displayed next to the category link.

4.2 Additional Findings

1. Participants wanted to see the photographs sorted chronologically. Nearly all of the participants said that they would want to see the images arranged in chronological order and/or grouped by decade. When asked, six of 11 wanted to see the most recent photographs first but five wanted to see the oldest images first. Participants were especially interested in seeing the progression of technology over the years. A few participants ordered their piles in a timeline detailing the preparation, collection, and analysis of Census data. In addition, participants wanted all images to be dated. One participant expressed a desire to see collages of images to represent periods of time.

Team Response: Pictures will be displayed chronologically from newest (most recent) to oldest.

2. Participants wanted to see recent photographs. When asked what photographs they would expect to see or what photographs were missing from the stack of images, participants frequently said that they wanted to see more recent images. They felt that the pictures "should come up to present date." Participants particularly wanted to see present-day technology so they could see how it has developed over time. They also wanted to see photographs of present day directors and workers.

Team Response: Because this is a historical Web site, only pictures dated year 2000 or earlier will be included. Newer pictures of enumeration are available and will be posted on the upcoming Web site. Each category will include pictures from all eras.

3. Participants found portraits, buildings, enumeration, and promotional materials easy to sort. These topics were easy to sort for participants and were often the first categories to materialize. Participants were faster to "finalize" these piles. One participant said that she "definitely [felt] comfortable with 'Public Relations'" as a category because it was "obvious," and also thought the images of enumerators were "pretty easy" to sort. She found these two categories to be "clearly unique." Another participant sorted most of the other topics in chronological order but separated out 'Notable People,' 'Buildings,' 'Enumeration,' and 'Promotional Materials,' because she felt that they were "clearly [their] own category."

Team Response: The categories "portraits," "buildings," "enumeration," and "promotional materials" formed natural groupings due to the number of cards in each category and the similar portrayals of content in each category. These groupings will likely be used on the web site.

4. Participants found machines and computers difficult to sort. Some participants voiced concern over their lack of knowledge on the machines and computers shown on the cards. One participant said that it was "most nebulous" when it came to creating her categories of preparing physical tools, operating calculation tools, and verifying data. The sheer number of photographs depicting machines and computers and the lack of knowledge participants had regarding older machinery made these cards difficult to sort. Machines and computers were often initially lumped together in one large pile, and the study administrator often had to ask participants to separate the pile into several categories. Many participants complained that the captions did not explain what the computer/machine was for or what it did. One participant said that "several [captions] just said machinists" and that she "didn't know what that meant in relation to the Census."

Team Response: Each category on the Web site will only include roughly 20 photographs at any time. All captions will be re-written to be more informative.

5. Participants found some images difficult to sort because they did not seem to belong with the other images. Participants often felt that there was an implicit requirement for categories to contain more than one image. Participants often found the following cards difficult to sort because there appeared to be only one of that particular category in the entire set:

- 56- airplane 1930
- 33- population clock 1967
- 36- Three Stooges 1940
- 32- fire drill
- 31- blood drive

One participant called the photograph of a blood drive a "horse of a different color" and said that it was "a tough one" to sort. Participants who had difficulty categorizing the image of the Three Stooges often wanted to create a Media category but felt hesitant to do so because they did not feel a category could only contain one image. The fire drill and blood drive images were often grouped together with buildings, likely because these events occurred at the National Processing Center. The airplane image was often grouped with buildings because users said that the picture was taken (of the plane) on land that would then become the Census Bureau.

Team Response: The fire drill and blood drive pictures will be included under the category People at Work. There are more diverse photographs of Census promotions that will be grouped with the Three Stooges and population clock images. The airplane photograph will be included in the Buildings category.

6. Participants found some terminology difficult to understand. The most common terms that participants thought would be difficult for the average person to understand were 'enumerator,' 'Hollerith tabulator,' 'FOSDIC,' and 'pantograph.' Most participants said that they could infer the meaning of 'enumerator' after viewing the images, but the same was not true for 'tabulation.' One participant said, "If you're using acronyms, it's meaningless to the average person." Another participant questioned, "Is there a difference between enumerator and regular interviewer?"

Team Response: Tool tips will be provided for difficult terminology and acronyms. A separate glossary will also be available on the Web site.

7. Favorite Photographs. During debriefing, participants were asked to pick their favorite five images from each of their piles. If there were seven or fewer photographs in a pile, the participant was asked to choose one or two favorite images. A few participants were particular about the images they selected and sometimes chose fewer than five images in a large pile because they could not find any more images they liked in that pile. Participant 5, an older adult, was not asked to choose her favorite images because her session ran unusually long and interfered with another appointment. The top favorite photograph across all participants was the Listen to the Drum 1990 promotional poster, chosen by 77% (17 of 22) of the participants. The top 23 photographs that were participants' favorites and their frequency of being chosen are shown in Table 4. A complete table is shown in Appendix G.

Table 4. Participants' Favorite Photographs and Frequency of Being Chosen

Count	Card number	Description
17	10	Listen to the Drum poster 1990
16	39	Director portrait 1850
15	40	Herman Hollerith 1890
15	82	Navajo 1930
15	83	Kentucky farm 1910
13	46	HQ in DC 1940
12	33	Pop clock 1967
12	36	3 stooges 1940
12	78	Horseback enumerate 1940
12	84	Truman enumerate 1950
11	26	Cartographers 1950
11	54	Aerial view
11	63	Lady w big book 1920
11	110	Drawing photograph 1890
10	3	Operating UNIVAC 1960
10	9	Wall of microfilm 1960
10	17	Generations poster 2000
10	18	Puerto Rico poster 2000
10	37	Director Rogers 1915-1921
10	45	Questionnaire Nat Proc Cen 2000
10	51	Exterior of HQ
10	79	Chinese laundry 1960

Team Response: When the Web site first goes live, there will be roughly 20 photographs in each category, and the photographs most commonly chosen as favorites will likely be included. If photos will be used as "covers" to the "folders" of each category, these favorites will likely be used for the covers.

5.0 Conclusion

It appears that people generally found the content of the photographs to be interesting. Most participants found all of the images to be important and did not have any particular photographs they expected to see but which were not included. One participant remarked that he was "quite surprised to see that there's so much history at the Census Bureau." A few participants remarked that they could pick out a lot of information from the older photographs such as the working environment, how people dressed, and other small but interesting details.

Findings indicated that people want the site to use informative and understandable captions for all photographs, so their interest will be captured and the educational value of the site will be increased. Participants expressed that they wanted the site to:

- Spell out acronyms, use easy to understand words, rather than difficult terminology, and provide definitions where appropriate
- Describe the importance and significance of each picture. The viewer should be able to ascertain what is happening in each image and why it is important.
- Give context to pictures by including the date the image was created or photographed. Arrange the information chronologically so that viewers can see how things changed and progressed over time.

Other participant recommendations include:

- If images of the new Census Bureau Headquarters, completed in 2006, are to be provided on the Web site, consider adding more recent photographs of other topics.
- Include all of the images that were often chosen as favorites, shown in Table 4.

Based on card-sorting results, the Photos section will be broken down into approximately eight categories. Once the "Sights and Sounds" page goes live, we recommend usability testing to see if the groupings and labels work for users when they are seeking something in particular.

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Appendix A. List of Cards with Assigned Numbers and Image Descriptions

01- supervising UNIVAC
02- technicians lg computer 1960
03- operating UNIVAC 1960
04- ENIAC 1940
05- lady operating FOSDIC 1960
06- FOSDIC 1960
07- 6 ladies microfilm 1940
08- woman microfilm FOSDIC
09- wall of microfilm 1960
10- Listen to the Drum poster 1990
11- eagle poster 2000
12- CNMI poster 2000
13- Samoa poster 2000
14- Census promotion vehicle 2000
15- 1970 button
16- 1980 button
17- generations poster 2000
18- Puerto Rico poster 2000
19- Guam poster 2000
20- Asian community poster 2000
21- machinist at work
22- machinist at machine 1950
23- many geographers 1940
24- Vital Stats Div 1920
25- year book photo 1960
26- cartographers 1950
27- machinist C35F
28- many employees pc 1920
29- many employees, Farm Census 1935
30-machinists at work 1950
31- blood drive
32- fire drill
33- pop clock 1967
34- ribbon cutting
35- ground breaking
36- 3 stooges 1940
37- director Rogers 1915-1921
38- executives 1940
39- director portrait 1850
40- Herman Hollerith 1890
41- Alum 1890
42- assistant director 1921
43- man over questionnaire 1980
44- lady prepares mail 1980
45- questionnaire Nat Proc Cen 2000
46- HQ in DC 1940
47- NPC in Jeffersonville sepia 1960
48- NPC
49- NPC in Jeffersonville in color 1960
50- artist image of HQ 2006
51- exterior of HQ
52- HQ Building #3 gray, 1980
53- Census HQ 2006
54- aerial view
55- Emery 1900-1920
56- airplane 1930
57- HQ Building #3 in color 1980
58- supervise Unemployment Census 1937
59- many verify 1940
60- many men from back 1940
61- lady verifying 1930
62- many verifying 1940
63- lady w big book 1920
64- recording record 1940
65- many employees, verifying, 1940
66- many employees from back 1940
67- archives 1940
68- Harpers 1870
69- eagle badge 1900
70- striped badge 1960
71- movie enumerator 1930
72- enumerator w mail 1980
73- double pic, enumerators 1980
74- enumerate family 2 babies

75- 1980 enumerator
76- enumerator baby 1950
77- enumerator, mower, 1950
78- horseback enumerate 1940
79- Chinese laundry 1960
80- farmer 1940
81- movie 2 ladies enumerate 1920
82- Navojo 1930
83- Kentucky farm 1910
84- Truman enumerate 1950
85- machinist building sorter 1940
86- building a pc sorter 1940
87- Hollerith dial 1890
88- machinists build tabulator 1930
89- pc sorter solo 1919
90- Hollerith tabulator and sorter
91- circuit press 1890
92- Hollerith drawing 1890
93- large pc
94- pc sorter in shop
95- woman prepares pc 1920
96- lady typing pc 1950
97- few employees pc sorter 1940
98- tabulate Farm 1935
99- man tabulating 1917
100- 2 men tabulating1917
101- tabulator in front of ladys face 1908
102- man at Hollerith 1908
103- key punch 1940
104- 2 men Hollerith 1902
105- man operates pc sorter 1930
106- operate pc 1922
107- close up pantograph 1940
108- lady key punch pc 1940
109- pantograph pc tabulation 1908
110- drawing pantograph 1890
111- prepares pc 1940
112- training pc
113- sorting pc- Farm Census 1935
114- man operates card sorter 1940
115- clerk with key punch 1920
116- many transfer 1940
117- key punch 1940
118- young lady pantograph 1940
119- lady sorting at Hollerith 1908
120- lady typing Hollerith 1908
121- accounting machine

Appendix B. General Introduction

Thank you for your time today. My name is (Test Administrator). I work here in the U.S. Census Bureau Usability Lab, and I will be working with you today. In this lab, we evaluate how easy or difficult Census products are to use. We bring in people like you who are potential users of our products to try them out while there is still time to make changes to them.

Sometimes we evaluate products before they are available. In these cases, we ask people like you to assist us in creating them. Today, I will be asking you to organize photographs in a way that seems to make sense to you. These photographs will be used on one of our Web sites, but we need your help to ensure that they are organized properly. Organizing them properly will ensure that people, such as you, who visit our sight looking for them can find them.

I am going to give you a stack of cards. I would like you to take your time and place them into piles that seem right to you. Then I will have you label these piles. At the end of the session, I will ask you some questions about your piles. The entire session should last about an hour.

Before we start, there is a form I would like you to read and sign. It explains the purpose of today's session and your rights as a participant. It also informs you that we would like to audiotape the session to get an accurate record of your feedback. Only those of us connected with the project will listen to the tape and it will be used solely for research purposes. Your name will not be associated with the tape or any of the other data collected during the session. ***[Hand consent form; give time to read and sign; sign own name and date.]***

Thank you.
Before we start, I want to tell you that you can't make a mistake or do anything wrong here. We are going to use your comments and data as well as comments and data from the other participants to give feedback to the developers of the site. Remember, we are not evaluating you or your skills, but rather you are helping us see how best to organize this information. Please share both your positive and negative reactions to the project. And remember, there are no right or wrong answers.

While you are working, I would like you to think aloud. In other words, I'd like you to tell me what you are thinking, describe the steps you are taking, why you are doing what you are doing, why something goes in one pile and not another, etc. Tell me if you are looking for something and what it is and whether you can find it or not.

Ok, now we will practice thinking aloud while you sort this set of cards. ***[Give practice cards and do a practice task.]***

Ok, that was fine. Do you have any questions about the "think-aloud" process we've just practiced and that I have asked you to use?

Ok, now we are ready to begin. Please take a moment to complete this questionnaire on your experience with computers and the Internet. Here are your cards. When you have completed the questionnaire and are ready to begin, you can get started. Just begin creating your piles in the way that seems right to you. And remember to think aloud.

Do you have any questions?

Appendix C. Consent Form

Consent Form
Card-Sorting Study for the Census History: Sight and Sounds Web page

Each year the Census Bureau conducts many different usability evaluations. For example, the Census Bureau routinely tests the wording, layout and behavior of products, such as Web sites and online surveys and questionnaires. In this case, we are asking for your help in organizing information for a Web page that is being designed to help people learn about the history of the Census Bureau.

You have volunteered to take part in a study to improve the organization of elements of the Web page mentioned above. In order to have a complete record of your comments, your usability session will be audio taped. We plan to use the tapes to improve the design of the Web site. Only staff directly involved in the research project will have access to the tapes. Your participation is voluntary and your answers will remain strictly confidential.

This usability study is being conducted under the authority of Title 13 USC. The OMB control number for this study is 0607-0725. This valid approval number legally certifies this information collection.

I have volunteered to participate in this Census Bureau usability study, and I give permission for my tapes to be used for the purposes stated above.

Participant's Name: _____

Participant's Signature: _____ Date: _____

Researcher's Name: _____

Researcher's Signature: _____ Date: _____

Appendix D. Questionnaire on Computer Use and Internet Experience

1. Do you use a computer at home or at work or both?
(Check all that apply.)
___ Home
___ Work
___ Somewhere else, such as school, library, etc.

2. If you have a computer at home,
a. What kind of modem do you use at home?
___ Dial up
___ Cable
___ DSL
___ Wireless (Wi-Fi)
___ Other _____
___ Don't know

b. Which browser do you typically use at home? Please indicate the version if you can recall it.
___ Firefox
___ Internet Explorer
___ Netscape
___ Other _____
___ Don't know

c. What operating system does your home computer run in?
___ MAC OS
___ Windows 95
___ Windows 2000
___ Windows XP
___ Windows Vista
___ Other _____
___ Don't know

3. On average, about how many hours do you spend on the Internet per day?
___ 0 hours ___ 1-3 hours ___ 4-6 hours ___ 7or more hours

4. On average, about how many hours do you use the Internet per week?
___ 0 hours ___ 1-3 hours ___ 4-6 hours ___ 7or more hours

5. What do you use the Internet for **more**:

_____ Searching / Surfing the web **or** _____ Answering / Sending e-mail

6. Have you ever done research on historical topics, including on genealogy?
☐ Yes ☐ No

a. If yes, about how many times have you researched historical topics?_____
b. If yes, have you researched historical topics on the Internet in the last two months?
☐ Yes ☐ No

7. How often do you use different media (i.e., photos, audio, video streams) on the Internet?

_____

8. Please rate your overall experience with the following:
Circle one number.

	No experience								**Very experienced**
Computers	1	2	3	4	5	6	7	8	9
Internet	1	2	4	5	5	6	7	8	9

9. What computer applications do you use?
Mark (X) for all that apply

___ E-mail
___ Internet
___ Word processing (MS-Word, WordPerfect, etc.)
___ Spreadsheets (Excel, Lotus, Quattro, etc.)
___ Databases (MS-Access, etc.)
___ Accounting or tax software
___ Engineering, scientific, or statistical software
___ Other applications, please specify_____

Circle one number for each question below.	**Not Comfortable**				**Comfortable**
10. How *comfortable* are you in learning to navigate new Web sites?	1	2	3	4	5
11. Computer windows can minimize, resize, and scroll through. How *comfortable* are you in manipulating a window?	1	2	3	4	5
12. How *comfortable* are you using and navigating through the Internet?	1	2	3	4	5
	Never				**Very Often**
13. How *often* do you work with any type of data through a computer?	1	2	3	4	5
14. How *often* do you perform complex analyses of data through a computer?	1	2	3	4	5
15. How *often* do you use the Internet or Web sites to find information? (e.g., printed reports, news articles, data tables, blogs, etc.)	1	2	3	4	5
	Not familiar				**Very familiar**
16. How *familiar* are you with the Census (terms, data, etc)?	1	2	3	4	5
17. How *familiar* are you with the current Census History Web site?	1	2	3	4	5

18. What is your date of birth? _____
month year

19. What is the highest grade of school you have completed, or the highest degree you have received?
a) [ ] Completed ninth grade or below
b) [ ] Some high school, but no diploma
c) [ ] Completed high school with diploma or received a GED
d) [ ] Vocational training beyond high school
e) [ ] Some college credit
f) [ ] Associates degree (AA/AS)
g) [ ] Bachelor's Degree (BA/BS)
h) [ ] Master's degree (MA/MS)
i) [ ] Professional degree
j) [ ] Doctoral degree

For options D through J above, indicate area of study: _____

20. What is your gender?

_____ Male _____ Female

21. Do you consider yourself to be of Hispanic, Latino, or Spanish origin?

_____ Yes _____ No

22. What is your race? Choose **one or more** races.
(Optional. We ask this question to ensure a diverse sample of people is in each study.)

_____White
_____Black or African American
_____Asian
_____Native Hawaiian or Other Pacific Islander
_____American Indian or Alaska Native

Appendix E. Debriefing Questionnaire

1. Were there photos that had double meanings, different meanings, or no meaning for you?

2. Were there photos you expected to see but didn't?

3. What photos would you add (to these piles)? What photos are missing from these piles?

4. Were there any photos that you would not include or that you feel are not important enough to include?

5. What photos have no meaning or a different meaning from what is listed?

6. Why did you label the piles this way? What meaning do these piles have for you?

7. Was the description of each photo easy to understand?

8. Were any terms used that you thought might be difficult for the average person to understand?

9. What group of photos was most interesting to you?

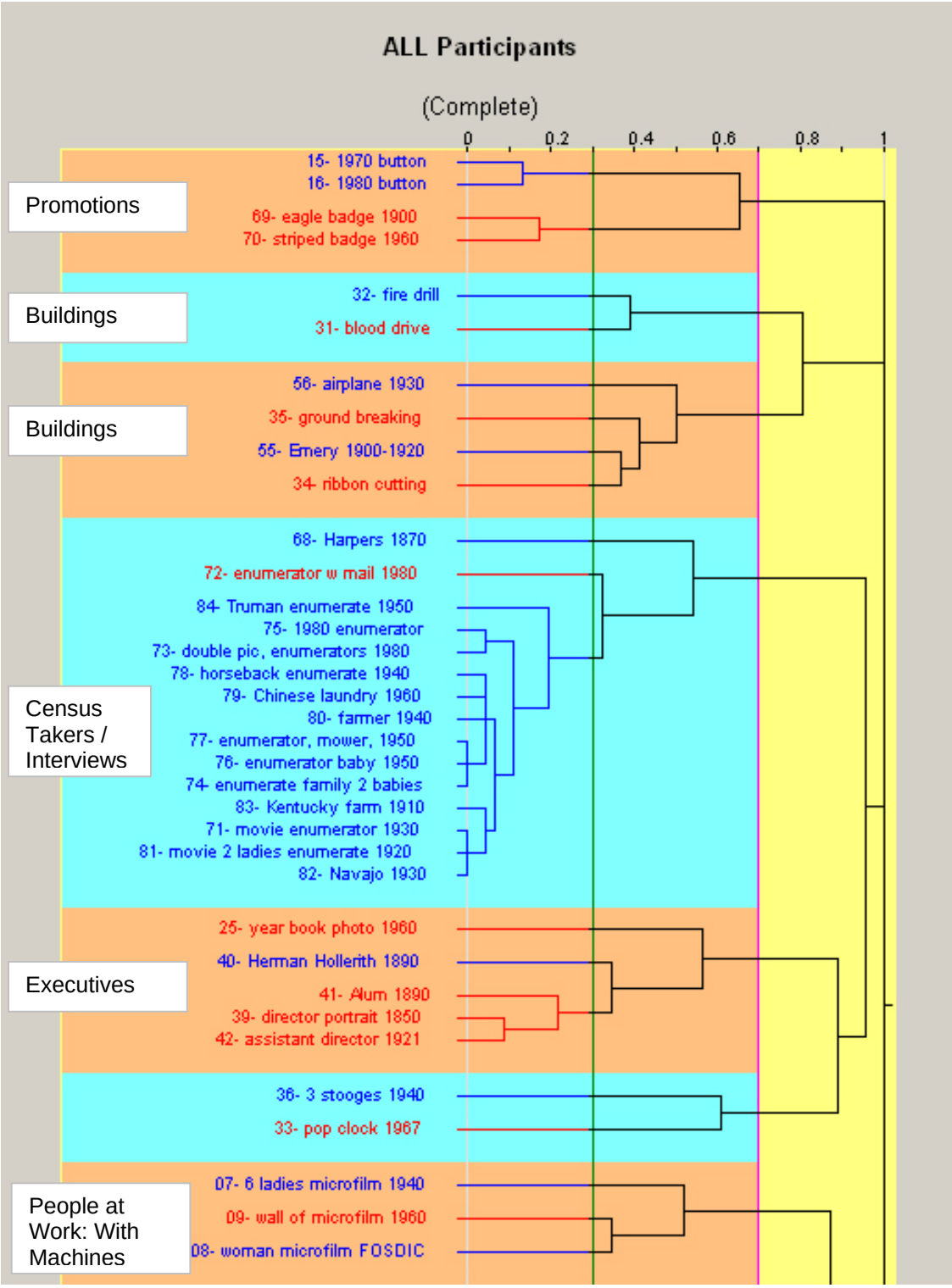
10. What group of photos was least interesting to you?

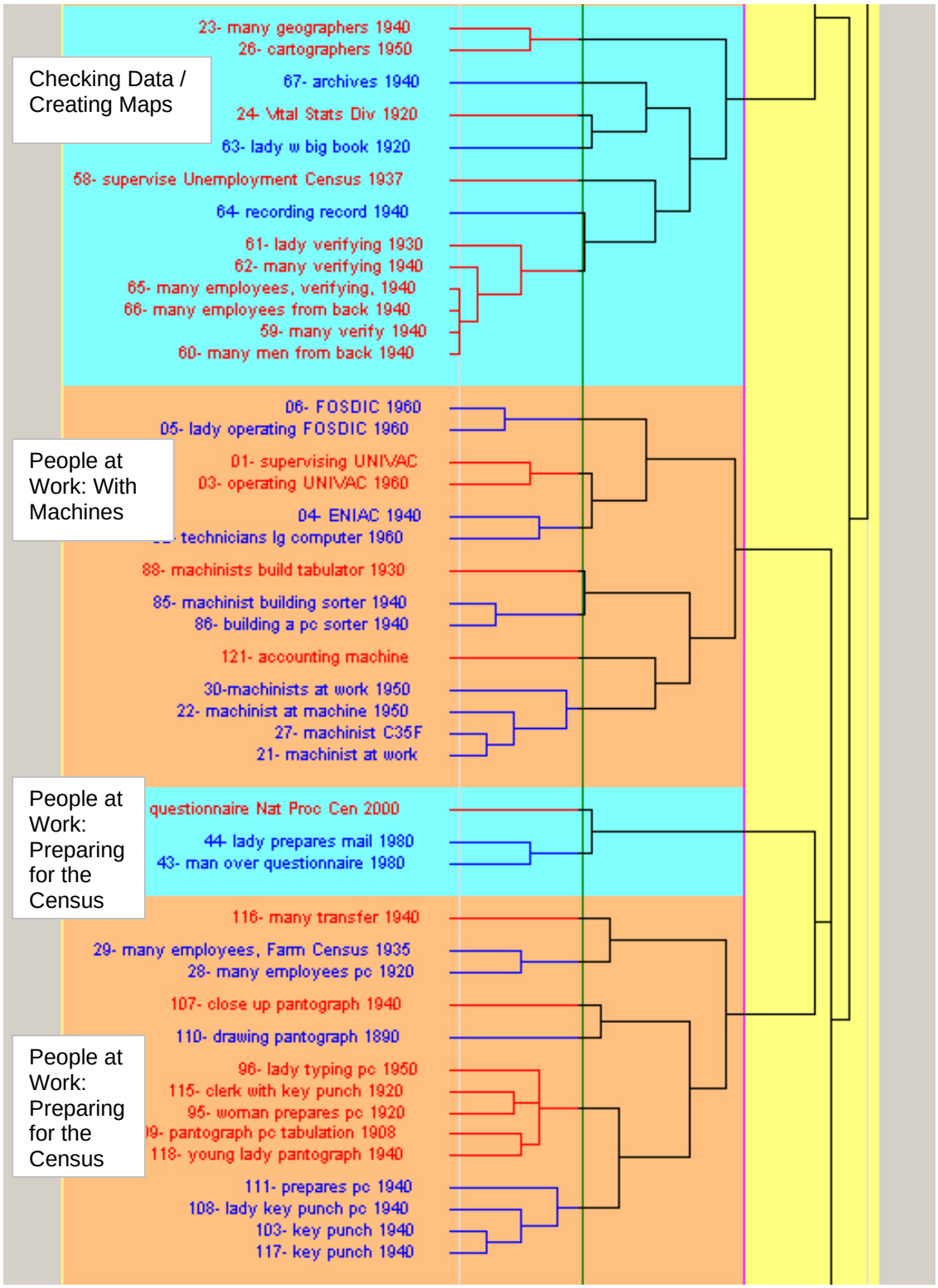
11. What would you like to see more of?

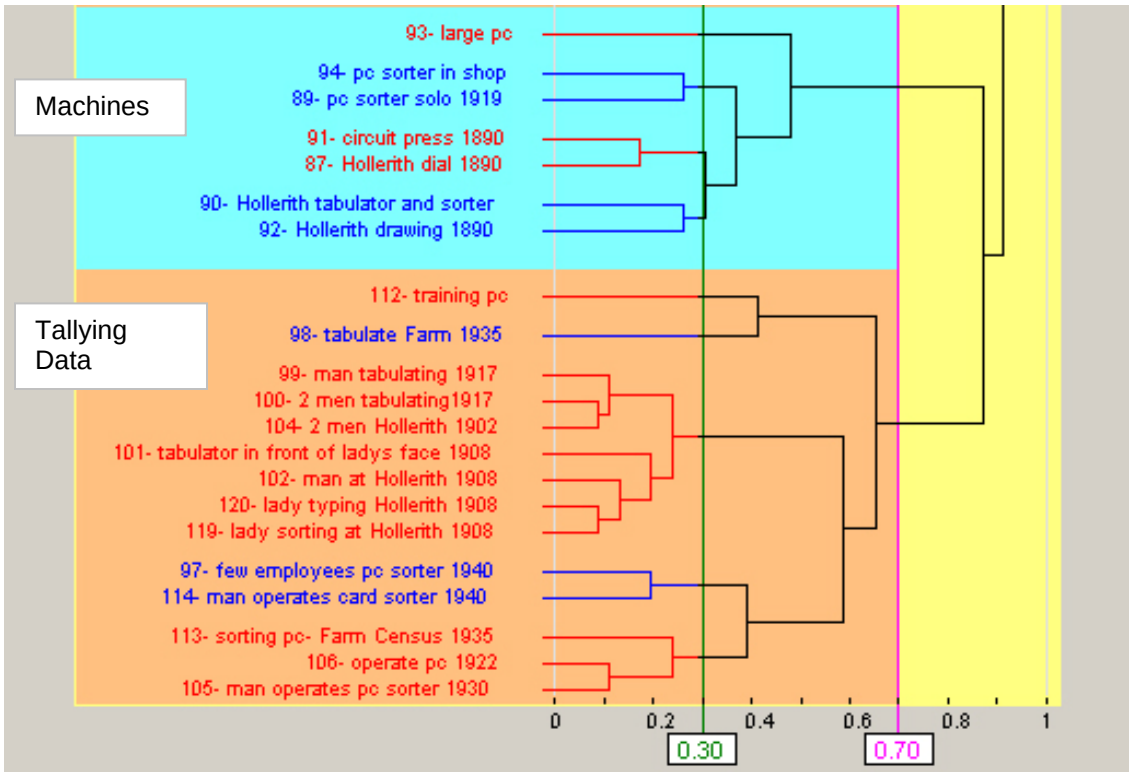
12. What would you like to see less of?

13. What were your favorite 5 photos from each group?

Appendix F. Dendrogram of All Participants' Groupings




Checking Data / Creating Maps
23- many geographers 1940
26- cartographers 1950
67- archives 1940
24- Vital Stats Div 1920
63- lady w big book 1920
58- supervise Unemployment Census 1937
64- recording record 1940
61- lady verifying 1930
62- many verifying 1940
65- many employees, verifying, 1940
66- many employees from back 1940
59- many verify 1940
60- many men from back 1940
People at Work: With Machines
06- FOSDIC 1960
05- lady operating FOSDIC 1960
01- supervising UNIVAC
03- operating UNIVAC 1960
04- ENIAC 1940
technicians lg computer 1960
88- machinists build tabulator 1930
85- machinist building sorter 1940
86- building a pc sorter 1940
121- accounting machine
30-machinists at work 1950
22- machinist at machine 1950
27- machinist C35F
21- machinist at work
People at Work: Preparing for the Census
questionnaire Nat Proc Cen 2000
44- lady prepares mail 1980
43- man over questionnaire 1980
People at Work: Preparing for the Census
116- many transfer 1940
29- many employees, Farm Census 1935
28- many employees pc 1920
107- close up pantograph 1940
110- drawing pantograph 1890
96- lady typing pc 1950
115- clerk with key punch 1920
95- woman prepares pc 1920
9- pantograph pc tabulation 1908
118- young lady pantograph 1940
111- prepares pc 1940
108- lady key punch pc 1940
103- key punch 1940
117- key punch 1940


Machines
Tallying Data
93- large pc
94- pc sorter in shop
89- pc sorter solo 1919
91- circuit press 1890
87- Hollerith dial 1890
90- Hollerith tabulator and sorter
92- Hollerith drawing 1890
112- training pc
98- tabulate Farm 1935
99- man tabulating 1917
100- 2 men tabulating1917
104- 2 men Hollerith 1902
101- tabulator in front of ladys face 1908
102- man at Hollerith 1908
120- lady typing Hollerith 1908
119- lady sorting at Hollerith 1908
97- few employees pc sorter 1940
114- man operates card sorter 1940
113- sorting pc- Farm Census 1935
106- operate pc 1922
105- man operates pc sorter 1930
0
0.2
0.4
0.6
0.8
1
0.30
0.70

Appendix G. Participants' Favorite Photographs and Frequency of Being Chosen

Count	Card number	Description
17	10	Listen to the Drum poster 1990
16	39	Director portrait 1850
15	40	Herman Hollerith 1890
15	82	Navajo 1930
15	83	Kentucky farm 1910
13	46	HQ in DC 1940
12	33	Pop clock 1967
12	36	3 stooges 1940
12	78	Horseback enumerate 1940
12	84	Truman enumerate 1950
11	26	Cartographers 1950
11	54	Aerial view
11	63	Lady w big book 1920
11	110	Drawing photograph 1890
10	3	Operating UNIVAC 1960
10	9	Wall of microfilm 1960
10	17	Generations poster 2000
10	18	Puerto Rico poster 2000
10	37	Director Rogers 1915-1921
10	45	Questionnaire Nat Proc Cen 2000
10	51	Exterior of HQ
10	79	Chinese laundry 1960
9	2	Technicians lg computer 1960
9	29	Many employees, Farm Census 1935
9	4	ENIAC 1940
9	16	1980 button
9	34	Ribbon cutting
9	52	HQ Building #3 gray, 1980
9	53	Census HQ 2006
9	55	Emery 1900-1920
9	68	Harpers 1870
9	80	Farmer 1940
9	90	Hollerith tabulator and sorter
9	116	Many transfer 1940
9	94	Punch card sorter in shop
8	5	Lady operating FOSDIC 1960
8	14	Census promotion vehicle 2000
8	31	Blood drive
8	38	Executives 1940
8	58	Supervise Unemployment Census 1937
8	61	Lady verifying 1930
8	87	Hollerith dial 1890
8	88	Machinists build tabulator 1930
8	91	Circuit press 1890
8	107	Close up pantograph 1940

7	8	Woman microfilm FOSDIC
7	15	1970 button
7	32	Fire drill
7	42	Assistant director 1921
7	43	Man over questionnaire 1980
7	44	Lady prepares mail 1980
7	59	Many verify 1940
7	76	Enumerator baby 1950
7	85	Machinist building sorter 1940
7	99	Man tabulating 1917
7	102	Man at Hollerith 1908
7	103	Key punch 1940
7	119	Lady sorting at Hollerith 1908
6	120	Lady typing at Hollerith 1908
6	115	Clerk with key punch 1920
6	93	Large pc
6	86	Building a pc sorter 1940
6	72	Enumerator with mail 1980
6	67	Archives 1940
6	56	Airplane 1930
6	49	NPC in Jeffersonville in color 1960
6	27	Machinist C35F
5	6	FOSDIC 1960
5	21	Machinist at work
5	25	Year book photo 1960
5	28	Many employees punch cards 1920
5	35	Ground breaking
5	47	NPC in Jeffersonville sepia 1960
5	57	HQ Building #3 in color 1980
5	64	Recording record 1940
5	65	Many employees, verifying, 1940
5	66	Many employees from back 1940
5	77	Enumerator, mower, 1950
5	89	Punch card sorter solo
5	92	Hollerith drawing 1890
5	97	Few employees punch card sorter 1940
5	98	Tabulate Farm 1935
5	112	Training pc
5	113	Sorting pc – Farm Census 1935
5	118	Young lady pantograph 1940
4	7	6 ladies microfilm 1940
4	11	Eagle poster 2000
4	13	Samoa poster 2000
4	19	Guam poster 2000
4	24	Vital Stats Division 1920
4	30	Machinists at work 1950
4	41	Alum 1890
4	50	Artist image of HQ 2006
4	60	Many men from back 1940
4	69	Eagle badge 1900
4	70	Striped badge 1960

4	73	Double pic, enumerators 1980
4	81	Movie 2 ladies enumerate 1920
4	96	Lady typing pc 1950
4	101	Tabulator in front of lady's face 1908
4	109	Pantograph pc tabulation 1908
4	1	Supervising UNIVAC
3	48	NPC
3	62	Many verifying 1940
3	74	Enumerate family 2 babies
3	95	Woman prepares pc 1920
3	108	Lady key punch pc 1940
3	117	Key punch 1940
3	114	Man operates card sorter 1940
2	100	2 men tabulating 1917
2	100	2 men tabulating 1917
2	104	2 men Hollerith 1902
2	105	Man operates pc sorter 1930
2	71	Movie enumerator 1930
2	75	1980 enumerator
2	12	CNMI poster 2000
2	111	Prepares pc 1940
2	106	Operate pc 1922
1	22	Machinist at machine 1950
1	23	Many geographers 1940