

Technical Report: Development of 14 dichotomous scale items measuring attitudes in the intent to participate in research

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## **Introduction and overview**

This report describes the development of 14 dichotomous scale items on privacy and trust attitudes. The items were designed for the specific goal of evaluating factors associated with the intent to participate in a research study where participation requires downloading and installing tracking software. The target audience for the report is researchers familiar with methods in the design of scale items. The report will be most useful for those interested in alternative methods for developing simple exploratory items for testing hypotheses, particularly where respondents are likely to have little incentive for completing a complex or demanding instrument.

The dichotomous items were derived from bottom-up analysis of open text responses collected in an initial pilot study conducted with a large undergraduate subject pool, where participation was rewarded with class credit.

This report is structured as follows. First, we provide background on the motivation and rationale for the initial pilot study and the subsequent development of the dichotomies. We then provide a general description of the instrument and scales used in the initial study, along with an overview the textual data. The report ends with details on the coding and clustering procedures used in creating the dichotomies.

## **Background on data collection**

The verbatim texts used to derive the dichotomies were collected in a pilot study on privacy and trust dispositions hypothesized to affect the intent to volunteer. The work was motivated by the challenge of recruiting and retaining participants for user studies on privacy-preserving data tracking systems. Prior studies have found low participation rates in such studies. For example:

- The Lemur Project's attempt to gather a sharable collection of web query logs fell short and was suspended (Community Query Log Project Results, 2010).

- A participation rate of 10% was reported for a study in which an affiliated population of Microsoft employees was recruited to a longitudinal tracking study (Guo, et al., 2011).
- A comparable participation rate was suggested in a small prior study of factors affecting participation in a tracking study (Smith, 2011).
- Russell and Oren (2009) discussed the effect of privacy concerns on research recruiting for a similar longitudinal study and suggested that clear, thorough, and detailed information about the system, privacy protections, and the collected data are essential.

The initial pilot study was designed as an exploration of these concerns through the use of existing and adapted scales from the literature on privacy and trust in the context of communication and information technology. These are detailed below. More specifically, we were interested in separating general factors in the intent to volunteer from factors associated with the need to download and install data tracking software as a requirement for participation.

As discussed below, because the pilot study yielded many invalid responses, the instrument was revised and the pilot was repeated about six months later using the same pool. A similar proportion of invalid responses was also found for the second pilot. After a careful review of details on participation requirements for receipt of class credit, we found that the threshold for acceptable completion was low. We then developed the dichotomies with the goal of creating an instrument that expressed the hypothesized major factors of interest, yet provided a simple response mechanism. A third study was then conducted using the dichotomies. Results from that study are reported elsewhere.

## The initial pilot study instrument

The initial pilot study used a quasi-experimental survey with two conditions. One group received information about a hypothetical study (h-study) requiring the download and installation of tracking software on a volunteer's own computer (*own*). The other group received information about the same h-study, with the only difference being that the software was to be installed on a computer in a research lab during a research appointment (*lab*), and not on one's own computer.

The study questionnaire was extensive, with about half of the questions covering computer and smartphone ownership and use, search engine use, privacy protection actions on computers and smartphones, prior experience with and knowledge of privacy violations, and demographics. The remainder of the questionnaire comprised scale items on privacy and trust attitudes adapted from the literature, as listed in Table 1. In this work, we were interested in the propensity to trust in general, and in specific, the propensity to trust where the trustees are defined as (1) people in general, (2) the researcher in specific, (3) the university as an institution, (4) information technology in general, and (5) university email technology in specific. We are also interested in privacy dispositions with respect to information technology in general, and websites and search engines in specific.

The general flow of the instrument was as follows. The initial questions asked about ownership and use, followed by dispositional scales on trust in people and in information technology. Next, questions focused on privacy preserving behavior, followed by dispositional scales on privacy attitudes toward information technology in general, as well as websites and search engines. A mock email about the assigned h-study was then displayed, followed by dispositional scales on trust in university email. This was followed by display of a mock disclosure about the assigned h-study, which preceded dispositional scales on trust in the university, in the university review board, and in the researcher. One of three open questions was then displayed, depending on the respondent's prior answers:

- Please explain briefly why you would *agree* to participate.

- Please explain briefly why you would *not agree* to participate.
- Please explain briefly what *other information* you would need to decide whether or not to participate.

### **Overview of the text responses**

The initial pilot study ran in the spring of 2014. 436 respondents consented, with 392 completing the instrument. Of these, 279 were found to contain invalid responses or to have a high probability of insincere responses. These were detected through various means, including analysis of elapsed page-completion times and straight-lined responses (every answer containing exactly the same value) within scale matrixes. Other responses were removed due to insincere response sequences, where a prior response was contradicted by a subsequent response. For example, responses were excluded if the respondent answered “NO” to “*Having read the letter, would you click the link to learn more about the study?*” and subsequently answered “YES” to “*Having read the information below, would you volunteer to participate?*”. Other records were found to contain text responses that were unrelated to the question asked. With removal of excluded records, 117 open text responses remained of the 366 received. These were coded as described below.

Of the 117 records, 59 were collected for the *own* condition, of which 39 expressed the intent to decline participation, 17 the intent to agree, with 3 undecided. Of the 58 from the *lab* condition, 40 expressed the intent to decline, 15 the intent to agree, with 3 undecided.

**Table 1. Attitudinal constructs investigated in the pilot study, with count of items, source literature is identified in the key that follows the table.**

Attitudes about:	General conceptual area	Underlying construct	# items	source
PEOPLE	Propensity to trust: Faith in humanity	Benevolence	3	4,6
		Integrity	3	4,6
		Competence	3	4,6
		Trusting stance: people	3	4,6
	Trusting beliefs in specific individual: researcher	Integrity	4	4,5
		Competence	4	4,5
Trusting stance: people		3	4,5	
INFORMATION TECHNOLOGY	Propensity to trust: Information technology	Faith in technology: general	4	7
		Trusting stance: technology	3	7
	Privacy dispositions: general	Information control	3	2
		Global information privacy concern	3	2,9
		Awareness of privacy practices	1	2,9
		Data errors	1	9
		Personalization using data	1	1
WEBSITES	Privacy dispositions: websites	Awareness of privacy practices	1	2,9
		Information collection	9	1,2,9
		Data errors	3	2,9
		Unauthorized secondary use	4	2,9
		Improper information access	3	2,9
		Personalization using data	4	1
		Notice and awareness	5	1,2
		Personal access to own information	2	1
SEARCH ENGINES	Privacy dispositions: search engines	Search history	5	8
		Search customization	3	1
		Combining data	1	1
INSTITUTIONS	Trust: Situational normality: General	General normality	2	3,4
		Benevolence	3	3,4
	Trust: Situational normality: University research center	Integrity	3	3,4
		Competence	3	3,4
		Internet	5	3,4
	Trust:: Structural assurance	University	4	3,4
UNIVERSITY EMAIL		Trusting beliefs in specific technology: university email	Reliability	4
Functionality	3		7	
Helpfulness	4		7	

\* asterisk indicates published scale

1. \*Earp, 2005
2. \*Malhotra, Kim, & Agarwal, 2004
3. McKnight & Chervany, 2002
4. \*McKnight, Choudhury, & Kacmar, 2002a
5. \*McKnight, Choudhury, & Kacmar, 2002b
6. McKnight, Cummings, & Chervany, 1998
7. \*McKnight, et al., 2011
8. \*Saint-Jean & Feigenbaum, 2010
9. \*Smith, Milberg, & Burke, 1996

## **Overview of coding process**

Three researchers, including the author, worked on the coding. All three were aware of the goals and content of the study. The objective of the coding was to derive tentative constructs that expressed factors the respondents considered in their intent to volunteer. After an initial approach to coding did not yield a useful schema, a second approach was used, as detailed below.

*Initial coding approach – abandoned.* One of the researchers (not the author) conducted the initial coding of the verbatim comments. In doing so, a code book was developed, which focused on the both the criteria and any valence on intent. These codes were set aside because many conflated criteria and valence, expressing the same criteria differently for each intent. Other codes were derived from interpretations that referred directly to concepts in the background literature. Because we were interested in all of the criteria used by respondents and not just those related to the existing scales, the coding scheme was abandoned in favor of one closer to the respondents' own terminology.

*Second coding approach – retained.* The two other researchers, including the author, then coded the verbatim comments. Coders were asked not read through all of the comments before beginning to code. This was done in order to avoid drawing conclusions about the relative importance of different comments; the goal was to capture each respondents' views. Coders were also asked avoid inferring intent or classifying the comments mentally by intent; the goal was to capture the criteria underlying the intent and not the intent itself. No limit was given on the number of codes to be used for each comment. Most comments received one to three codes.

During the coding process, the comments were presented in a spreadsheet in the order in which they were collected. Coders started at the top of the list and scanned each comment individually, with the objective of selecting words that expressed the key concepts in the comment. Resulting words or short phrases were recorded next to each comment. As the words were selected, these became codes, some of which were reused in coding similar concepts. Coders were instructed not to worry about using

exactly the same codes for each concept, as these would be reduced in a later round of coding. While coders were asked to derive codes from the respondents' terms as much as possible, they were also allowed to use terms that better expressed a concept where the respondent's words were likely to be unclear when taken out of context. They were also asked to make inferences where necessary. For example, in this response "I would feel more comfortable if I saw *the person* in a class offering to have participants" the concept "researcher" was coded under the assumption that "*the person*" mentioned was the researcher. After each coder made a first pass through all of the comments, they then reviewed the comments once, looking for large and obvious overlap in the codes. Only these were reconciled and recoded, as they were told not to work on reducing their codes because this would be done in the subsequent clustering step.

Because the third researcher was biased by the detailed coding done in the first approach, she did not complete the second coding process, but did participate in the clustering, as follows.

### **Overview of the clustering process**

*Preparation of the data.* After the coding was complete, the author combined all the codes into a single list and removed exact duplicates, leaving 206 codes representing the 117 records. These were then formatted for printing so that each was on its own slip of paper. A package of the printed codes was distributed to each of the three researchers.

*First round clusters – individual.* The researchers were instructed to work alone and cluster the paper slips into separate concepts. The instructions also requested that the clusters not be named but simply secured in separate stacks. No limit was given on the size of each cluster or on the number of clusters. These were brought to the first group clustering meeting.

*Second round clusters – group.* At the first round of group clustering, the three researchers worked at a large conference table to reconcile and refine the three individual sets of clusters. This started with a



brief discussion of the clustering process used by each researcher, followed by a methodical although not rigid process, which proceeded as follows:

1. One researcher started by describing a cluster briefly while placing all the associated terms for the cluster in a pile on the table.
2. One of the other two researchers would then consider how their clusters related to the one proposed. Generally, this resulted in one or more of the following three actions:
  - a. placing all copies of the same terms into the pile, even when those terms came from more than one cluster (agreement),
  - b. placing other related terms into the cluster pile (expansion),
  - c. proposing an associated but different cluster, which was placed in a pile adjacent to the first pile (differentiation).
3. The third researcher would then consider her clusters and take one of the above three actions.
4. When other related terms were added to a cluster, or an associated cluster was proposed, the other researchers were then obliged to consider their clusters and respond with agreement, expansion, and/or differentiation. Also, every researcher was free to propose moving some or all of the terms from one cluster to another, although this was infrequent.

These steps continued until all of the terms were included in one or more of the clusters. The clustering was conducted with minimal discussion in order to limit interpretation and persuasion, and to keep the respondents' language foremost in the process. Generally, few whole clusters were moved or combined during this process. A total of twenty-seven clusters were generated, with the largest comprising 16 terms and the smallest 3. The mean size was 7.9 terms, with a median of 7 and a mode of 4. Once the clusters were final, they were assigned temporary names, generally using one or two words. The clusters from the second round are listed in Table 2 along with their temporary names and underlying codes.

**Qualities of Commun.**

accuracy  
 consistent  
 consistent information  
 information  
 information provided  
 more information  
 need more information  
 not enough information  
 not enough detail  
 lack of details  
 lack of depth  
 answers questions  
 questions answered  
 specific explanation  
 thorough explanations  
 different explanations

**Char of Researcher**

concern for participant  
 cares about me  
 my best interests  
 competent  
 competence  
 expert  
 researcher  
 need to prove  
 could [not] prove claims

**Safety**

safe  
 safety  
 safer  
 not safe  
 is not safe

**Access**

access  
 access to my computer  
 my computer

**Technology Security**

secure  
 lack of security  
 security information  
 information protection

**Privacy**

private information  
 personal information  
 personal privacy  
 privacy  
 Internet privacy  
 privacy is gone  
 loss of privacy

**Compensation/Incentive**

compensation  
 incentive  
 do not care about money  
 money  
 not enough  
 high reward  
 reward lackluster  
 small reward

**credit**

class credit  
 do not order online  
 Amazon vs cash  
 don't use amazon  
 not a raffle  
 low chance

**Personal Interest**

interest  
 not interested  
 enjoy  
 like  
 dislike research  
 care  
 do not care

**Duration of Study**

quick  
 too long  
 how long  
 when does it end  
 time period  
 a lot of time  
 length

**Is It Benefit // ME**

\*As in the true definition  
 of "Benefit" or really  
 about "Compensation"  
 benefit me  
 benefits me  
 no benefit to me  
 does not benefit me

**Motivation**

necessary  
 unnecessary  
 required  
 not required  
 no reason  
 no use  
 not needed

**Effort**

effort  
 little effort  
 easy  
 work  
 walking to library  
 too much trouble

**Software**

software  
 download  
 software install  
 what if  
 virus  
 malware  
 software trust  
 trust software function  
 future use

**IRB**

IRB  
 approval  
 university approval  
 university  
 oversight

**Time Management**

time  
 do not have time  
 too much time  
 waste of time  
 not worth time  
 spare time  
 free time  
 time for other priorities  
 other priorities  
 extracurricular activities  
 busy  
 not worth it  
 not worth

**Tech Skills**

skill  
 lack of technology skills  
 knowledge  
 lack of knowledge

**Control of Software**

turning off  
 is it off  
 edit [control] information  
 edit recordings

**Societal Values**

steal  
 immoral  
 surveillance is immoral  
 surveillance  
 voluntary

**Trust / Confidence**

confidence  
 not confident  
 trust  
 trustworthy  
 do not trust  
 legitimate  
 seems legitimate  
 credible  
 scam [personal info]  
 not a scam

**Tracking**

record my activities  
 actions recorded  
 record search history  
 browser history  
 history  
 my history  
 tracking  
 tracking searches  
 length of time for  
 tracking  
 monitoring  
 surveillance

**Kent State Email / University**

KSU safe  
 trust Kent  
 trust Kent email  
 don't know sender of  
 email  
 university  
 university email  
 email  
 authenticity  
 reputable  
 reputable source of  
 information

**Altruism**

value of research  
 help out  
 make a difference  
 benefits people  
 helping people  
 help others  
 researcher effort  
 people work hard

**Complexity**

complicated  
 no understanding  
 don't know much about  
 do not understand

**Actions Needed /**

**Possible Actions**  
 know others' opinions  
 teacher opinions  
 friends opinions  
 contact information  
 phone numbers  
 don't know sender of  
 email  
 need confirmation  
 less reliable  
 less reliable than in  
 person  
 in person  
 personal knowledge of  
 researcher  
 personal connection

**Past Experience**

personal experience  
 prior experience with  
 research  
 familiar with research  
 not familiar  
 unfamiliar software  
 never heard of the  
 software  
 familiarity with  
 application  
 familiarity  
 don't know much about

**Internal Feelings**

uneasy  
 afraid  
 worry  
 nervous  
 discomfort  
 not comfortable  
 uncomfortable  
 comfort  
 cautious  
 personal caution  
 suspicious  
 skeptical

*Third round clusters – creating the dichotomies.* In the final round of clustering, the group met again to refine, combine, and name the clusters. The goal was to derive a set of criteria for the intent to volunteer, as well as polar dispositional terms defining a subjective dichotomous scale for each. This clustering was conducted by placing the 27 named concept piles on the table and, through discussion and consensus, reorganizing them until agreement was reached on the main criteria. Clusters formed of dispositions related to criteria were collected in a separate final cluster. Many of these terms were then used as anchors in the dichotomies. The final clusters are listed in Table 3, along with the round 2 clusters that underlie each, and their bipolar dispositions.

Dichotomy	Temporary cluster names - round 2	Derived criterion	Bipolar dispositions	
Opinions	<ul style="list-style-type: none"> <li>• Actions Needed / Possible Actions</li> </ul>	Before volunteering, getting someone else's opinion is:	Essential to me	Unessential to me
Helping	<ul style="list-style-type: none"> <li>• Altruism</li> </ul>	Helping by volunteering is	Important to me	Unimportant to me
Researcher	<ul style="list-style-type: none"> <li>• Characteristics of Researcher</li> </ul>	The researchers is:	Trustworthy	Not trustworthy
Ease	<ul style="list-style-type: none"> <li>• Complexity</li> <li>• Effort</li> </ul>	Completing the study would be:	Easy	Difficult
IRB	<ul style="list-style-type: none"> <li>• IRB</li> </ul>	University IRB approval makes me:	Confident	Skeptical
Email	<ul style="list-style-type: none"> <li>• Kent State Email / University</li> </ul>	Kent State email is:	Trustworthy	Not trustworthy
Interest	<ul style="list-style-type: none"> <li>• Motivation</li> <li>• Personal Interest</li> </ul>	The study is:	Interesting to me	Uninteresting to me
Privacy	<ul style="list-style-type: none"> <li>• Privacy</li> </ul>	The privacy protections are:	Sufficient	Insufficient
Information	<ul style="list-style-type: none"> <li>• Qualities of Communications</li> </ul>	The information I have been given is:	Enough to decide	Not enough to decide
Money	<ul style="list-style-type: none"> <li>• Compensation/Incentive</li> <li>• Is It Benefit // ME</li> </ul>	The money is:	Satisfactory	Unsatisfactory
Software	<ul style="list-style-type: none"> <li>• Safety</li> <li>• Software</li> <li>• Tech Skills</li> </ul>	Downloading software makes me feel:	Worried	At ease
Time	<ul style="list-style-type: none"> <li>• Duration of Study</li> <li>• Time Management</li> </ul>	The study is:	A good use of my time	A poor use of my time
Tracking	<ul style="list-style-type: none"> <li>• Technology Security</li> <li>• Access</li> <li>• Control of Software</li> <li>• Tracking</li> <li>• Societal Values</li> </ul>	Tracking my Internet activities is:	Acceptable to me	Unacceptable to me
Dispositions	<ul style="list-style-type: none"> <li>• Internal Feelings</li> <li>• Past Experience</li> <li>• Trust / Confidence</li> </ul>			