CURRENT RESEARCH IN SOCIAL PSYCHOLOGY

http://www.uiowa.edu/~grpproc/crisp/crisp.html

Submitted: July 20, 2010
First Revision: September 1, 2010
Accepted: September 4, 2010

AN AFFECT CONTROL THEORY OF TECHNOLOGY

Daniel B. Shank
University of Georgia

ABSTRACT

Affect control theory is a theory of interaction that takes into account cultural meanings. Affect control research has previously considered interaction with technology, but there remains a lack of theorizing about inclusion of technology within the theory. This paper lays a foundation for an affect control theory of technology by addressing key assumptions, presenting an empirical foundation using a survey of sentiments toward technology, and analyzing those sentiments.

AFFECT CONTROL THEORY

Affect Control Theory (ACT; Heise 1979; Heise 2007) is a formal, mathematical theory modeled at the level of an observed-situation. There must an observer who is a member of a language-culture (Robinson and Smith-Lovin 2006:139). The observer labels the elements of the situation, including actors, behaviors, setting, and emotions. When labeling elements of a situation, an observer uses labels from her language-culture. These labels evoke affective sentiments that are fairly stable within a language-culture (Osgood, May and Miron 1975). After elements of a situation are labeled, ACT proposes that the observer realizes if the situation is aligned with cultural norms or represents a deflection from cultural norms based on the affective sentiments. In the case of deflection, the observer tries to restore a coherent definition of the situation.

ACT relies on (1) a metric that is used to measure both the cultural sentiments attached to labels and specific situational impressions attached to elements of the situation, (2) equations that model cultural norms, essentially describing how the affective impressions in a situation changes after interaction, and (3) an affect control principle that models observers maintaining a coherent definition of the situation through restorative behavior or cognition.

AFFECT CONTROL THEORY OF TECHNOLOGY

I argue that for ACT to be extended to include technological actors, three questions must be answered. These questions are closely related to the theory's assumptions and scope conditions. Evidence for answering these in the affirmative will essentially meet the general scope of ACT, enabling an affect control theory of technology. Partial evidence might suggest additional scope conditions.

(1) Do people view interactions with technological actors as social behaviors? For ACT to apply there must be "a directed social behavior" (Robinson and Smith-Lovin 2006:139). This condition is important because many interactions with technology may be asocial in nature. For example, if someone is interacting with a technology as a tool then it there may not be a social component. Research in *computers are social actors* (Brave, Nass and Hutchinson 2005; Nass and Moon 2000) suggests that any minimal cue by a technology signifying a social behavior is enough to instigate a social response. Technologies may be treated as social actors via many types of cues such as verbal cues (Isbister and Nass 2000), physical presence (Brave et al. 2005) or filling a social role (Ferdig and Mishra 2004). Therefore, there is already a substantial amount of evidence that people routinely view interactions with technological actors as social behaviors.

(2) Do people label technological actors with shared cultural identities? In ACT, the elements of the social experience must be labeled according to an observer's language-culture (Robinson and Smith-Lovin 2006:139). Just as a human might be labeled as a *doctor, racist,* or *bartender*, a technological actor might be labeled a *computer, computer virus,* or *biological weapon*. Identities are usually quite salient with technology, including many technological actors having the label written on them (e.g., iPod). Further, when technologies are created effort is put in to establishing specific labels as identifiers, whereas some labels and identities for humans may be rarely evoked (Burke and Stets 2009; Stryker 1980) and an individual may have hundreds of identities (MacKinnon and Heise 2010). Technologies, in general, have clearer identities than humans do.

(3) Do people in the same language-culture share affective sentiments for the technological actors' identities? If sentiments toward technological actors are not culturally shared, then ACT will not apply. If they are culturally shared, but exhibit different patterns from human-identity sentiments, then ACT might be differently applied to technology. Little data has been collected in the form of evaluation-potency-activity ratings for technological actors and some of it is dated (i.e., Osgood et al. 1975). King (2001) when studying Internet culture included *'Bot* and Troyer (2004) in a preliminary study collected values for *Computer, Run Analysis, Provide Output, Freeze,* and *Runtime Error 00xbs*. To address this third question I collect an ACT technology dictionary and analyze the data.

Indications that there are not culturally shared sentiments toward technology would include the following: (1) extremely high variation or variations substantively higher than previous ACT dictionary collection projects, (2) sentiments for related terms that are not intuitive (i.e., low face validity), and (3) cultural enclaves based on higher levels of interaction with that a particular technological actor or with technology in general. To explore these possibilities I conduct three analyses.

AFFECT CONTROL THEORY TECHNOLOGY DICTIONARY

Methods

Students at the University of Georgia in 2008 were recruited through multiple methods. Each participant rated 40 items from a larger list of 80 technology related stimuli. I selected 80 items based in part on widespread knowledge and diversity of types of technology and recent literature including ACT (Troyer 2004) and technology clustering (Vishwanath and Chan 2006). I randomized the presentation of the stimuli with the constraint that related items were not next to each other to reduce priming bias. Evaluation, potency, and activity were measured with semantic differential scales anchored with traditional ACT adjectives for each dimension and nine boxes representing the ratings -4 to +4.

Heise (2010:198) found that to reach a mean reliability of 0.90 or greater for all three dimensions of sentiment measurement, a minimum N of 26 was needed. Based on this, I make note of any data that does not reach a minimum of 26 ratings (Appendix A). Furthermore, demographic and technology-use information was collected after the item ratings. Technology-use questions included hours using a computer per day and hours on the Internet per day. Respondents were asked to mark any of twelve technological devices they used regularly or owned and to mark any of nine websites they visited regularly (Appendix B). Respectively, these were summed as a *technology-use index* and an *Internet-use index*.

Results

I collected surveys from 182 individuals, 106 women and 75 men with one survey eliminated because the respondent did not mark either gender. Additionally, the following surveys were eliminated consistent with previous ACT dictionary collections (Britt and Heise 1992; Heise 2010). Five women and one man reported living outside the US over half their lives. One woman did not answer the majority of the items, suggesting she was either not knowledgeable of technology or not taking the survey seriously. This left 174 survey respondents (100 women and 74 men), 95.6% of the original sample.

The subjects self-reported race/ethnicity for a sample of 135 whites, 5 Asians, 23 blacks, 4 Hispanics, and 7 other/multiracial. Ages varied from 18 to 52 (mean=20.8, median=20). The *technology-use index* had a mean of 6.11 (SD=1.88) out of 12. The *Internet-use index* had a mean of 4.34 (SD=1.51) out of 9. These were significantly correlated at .194 ($p<.01$). The mean number of hours per day using a computer was 3.45 (SD=2.30) and the mean hours per day on the Internet was 2.76 (SD=2.01). These were correlated at .863 ($p<.001$). Surprisingly, neither the *technology-use index* nor the *Internet-use index* was significantly correlated with hours on either a computer or the Internet.

Analysis 1: Statistical Variation

To determine if the participants agreed on the sentiments of the technology terms, I describe the standard deviations. Table 1 shows the standard deviations of the technology dictionary compared to the last major ACT dictionary (i.e., Indiana 2003 dictionary) (Heise 2009). The potency and activity dimensions of the technology dictionary have greater standard deviations compared to the Indiana dictionary for both men and women, whereas the evaluation standard deviations are similar in each dictionary. The technology terms are in no way a random sample of all technology identities as the Indiana dictionary is not a random sample of human identities. In general, the standard deviations are in the same general range for both dictionaries supporting a view of cultural consensus for technology terms.

Table 1: Standard deviations of two dictionaries for evaluation, potency, and activity

		Evaluation	Potency	Activity	N
Technology Dictionary 2008	Male	1.61	1.78	1.81	80
	Female	1.46	1.62	1.66	
Indiana Dictionary 2003	Male	1.56	1.24	1.09	500
	Female	1.72	1.38	1.24	

Note: Indiana Dictionary 2003 values are for identities only, accessed through *Interact.*

For men, only four of the 240 (1.7%) standard deviations of the term's sentiments are greater than an evenly distributed baseline's standard deviation (i.e., >2.62), indicating bimodality. For women, it is three of the 240 (1.25%) standard deviations. These seven included the evaluation of *Spyware* for men and women and *SUV* for men as well as the potency of *To Crash (as in a computer crashes)* and *Virus* for men, and *To Freeze (as in a computer freezes)* and *Web Error* for women. Overall, this suggests that sentiments toward technology terms produce a comparable amount of cultural consensus to non-technology terms although specific terms may have multiple cultural meanings (Thomas and Heise 1995).

Analysis 2: Comparison of Technology Terms

Several terms provide relevant comparisons via t-tests to show affective differences between technologies. *Computers* are extremely good, quite powerful and quite lively according to both men and women, but when adding a more specific identifier the ratings changed slightly. *Laptop Computers* are slightly higher in evaluation for women (p<.05; *ns* for men), whereas *Desktop Computers* (p<.001 for women; p<.01 for men) and *Microsoft Windows Computers* (p<.01 for both genders) are lower in evaluation, but still positive. Men view *Computers* in general as more powerful than all four specific identities of computers (p<.05 for all four t-tests), whereas women see *Computers* as more powerful than only *Desktop Computers* (p<.01; *ns* for the other three t-tests). Activity is lower, compared to *Computer*, for *Desktop Computers* and *Microsoft Windows Computers* (p<.001 for women; p<.01 for men). Given than both *Laptop Computer* and *Macintosh Computer* are similar to the undifferentiated *Computer*, I surmise that when people think of a computer they think of a Macintosh brand laptop, with Microsoft Windows and desktops as the lower status comparisons.

There are three sets of older-newer technologies. Comparing *VCR* to *DVD Player*, there is a large increase in evaluation, potency, and activity. The same is true from *Landline Phone* to *Cellular Phone*. Moving from sentiments of *Cassette Tape Player* to *CD Player* then to *Digital Audio Player* there is a fairly substantial jump in evaluation, potency, and activity for both men and women. The t-tests for all comparisons in all three sets were highly statistically significant (p<.01). There is a clear pattern as technologies transition from the maturity stage to the obsolescence stage of their lifecycle (Kurzweil 2000:19-20) of decreasing evaluation, activity, and potency. Therefore, these data have face validity following a lay understanding of the relationships between technologies.

Analysis 3: Influence of Technological Experience

One possibility is that affective sentiments toward technology are based on exposure to specific technologies. For example, Vishwanath and Chan (2006) found that adopters and non-adopters of technology had different view of which technologies were similar. ACT research finds that subcultures have different sentiments toward terms related to the subculture, but are similar to the larger language-culture on most terms (Kroska and Harkness 2006; Smith-Lovin and Douglass 1992). If this is the case, a technology subculture may have different sentiments from the rest of the population. King (2001) found evidence of an Internet subculture having specific affective sentiments toward Internet terms and these varied by the amount of time spent on the Internet. Based on this, I expect those heavily involved with technologies to have different views of them.

First, I analyze the relationship between the use of specific technologies and websites and the affective ratings of those technologies. I conducted t-tests for the sentiments of a device or website comparing between the group who reports using/owning a technological device or regularly visiting a website and those who do not.

Table 2: Comparison of affective sentiments of a technology regular users and non-users[a]

	N		Affective Sentiments					
			Evaluation		Potency		Activity	
	User	Non-user	User	Non-user	User	Non-user	User	Non-user
HD-TV	27 (30.7%)	61 (69.3%)	3.19	2.64*	2.59	2.33	3.15	2.36*
DVD	62 (73.8%)	22 (26.2%)	2.79	2.73	.92	1.41	1.53	2.45**
Desktop Computer	34 (36.6%)	59 (63.4%)	1.85	1.22	1.88	1.03*	.38	.31
Laptop	82 (94.3%)	5 (5.7%)	3.40	3.80	1.88	2.80†	2.43	2.60
DVR	18 (21.2%)	67 (78.8%)	3.50	2.60**	1.89	1.51	2.61	2.06
GPS	17 (20.0%)	68 (80.0%)	3.18	2.81	2.41	1.75	1.76	1.79
Digital Music Player	66 (75.9%)	21 (24.1%)	3.42	2.76*	1.41	1.62	2.56	2.24
PDA	6 (7.8%)	71 (92.2%)	3.33	2.18***	1.83	.86	2.17	1.82
YouTube	67 (72.0%)	26 (28.0%)	2.87	1.46**	2.42	2.35	2.78	2.65
Ebay	23 (27.7%)	60 (72.3%)	3.04	1.95***	3.04	1.68***	2.78	1.57***
Wikipedia	57 (64.8%)	31 (35.2%)	2.72	1.16**	2.11	.97**	1.79	1.13†
Myspace	12 (14.1%)	73 (85.9%)	1.25	-.73**	1.75	.79*	1.42	1.16
Facebook	82 (92.1%)	7 (7.9%)	2.63	-1.43**	2.51	.00*	2.95	.29*
Google Earth	19 (25.0%)	57 (75.0%)	2.95	2.56	2.89	2.26†	2.26	1.79
Google	82 (93.2%)	6 (6.8%)	3.27	2.50	2.98	2.67	2.52	2.50
Yahoo	32 (37.2%)	54 (62.8%)	2.50	.85***	1.88	.57**	1.78	.19***
Internet Radio	23 (27.4%)	61 (72.6%)	2.22	2.26	.91	.66	1.39	1.92

*** p≤.001, **p≤.01, * p≤.05, † p≤.1 two-tailed t-test between *user* and n*on-user.* Variances are not assumed to be equal.
[a] For the devices *user* refers to self reporting that one "owns or uses regularly" and for websites it refers to self-reports of visiting regularly.

Of the 18 technology terms that self-report of ownership was asked about, statistical comparisons could not be made on *Cellular Phone* due to less than five participants in the not-owning category. Of the remaining 17 technology terms (Table 2), 10 significantly differed (p≤.05) in evaluation, 6 in potency, and 5 in activity. Examining these closely, the data reveal that ownership/regular use increases one's evaluation, potency and activity ratings for 20 of these 21 significant differences. For *DVD Player*, ownership decreased the activity rating. Aside from this one case, the influence of regular-use or ownership on sentiments is straightforward.

Regular use or ownership of a technology is associated with the higher evaluation ratings may be from people using or buying a technology and then thinking more positively about it, or having a high regard for it and therefore buying it. The data do not allow me to determine this directionality. However, another possibility exists: the general use of technology may change individual's rating of technology. This possibility is the closest to a technology or Internet subculture perspective. To test this possibility I calculated the correlations between four technology-enculturation measures and the 240 sentiments (80 terms times 3 affective dimensions, both genders combined). The measures of enculturation are the *technology-use index*, *Internet-use index*, self-reported daily time on a computer, and daily time on the Internet. Significant affects at alpha=.95 would mean that approximately 12 correlations (i.e., 5%) should be significant by chance alone for each enculturation measure.

The data indicate the number of significant correlations with all sentiments is 23 (9.58%) for the *technology-use index,* 21 (8.8%) for the *Internet-use index*, 15 (6.3%) for the number of hours daily spent on a computer, and 11 (4.6%) for the number of hours daily spent on the Internet. The set of correlations furthest from the expected 12 significant correlations was the *technology-use index*. Those 23 significant correlations included 9 with the evaluation of terms, 7 with the potency, and 7 with the activity. About the same number were negative (12) and positive (11) correlations, but, interestingly, all three dimensions had positive correlations for *HDTV* and negative correlations for *Minivan*.

The *technology-use index* having the most correlations with sentiments supports the idea of enculturation of a technology subculture, not unlike King's Internet subculture (2001). Overall, the low number of significant correlations for all measures suggests that while technology enculturation has some effect, it is minimal. I conclude that the affective culture of technology is much more permeable, with owning specific technologies and visiting specific websites contributing more toward sentiments than general technological enculturation. However the technology enculturation argument cannot be dismissed as I did not measure a population representing a technological subculture, but instead a non-random sample.

DISSCUSSION

This paper considered three questions in order to expand affect control theory into the realm of human-technology interaction. The first question was if human-technology interactions were social behaviors, and the answer is a large body of literature that says with any minimal social cue, technology is treated like a social actor. The second question was if technology is labeled with cultural identities, and the answer was intuitive: most technologies are labeled and their identities are highly agreed upon. The third question asked if affective sentiments for technological actors are culturally shared and three analyses of data of technology sentiments suggest that it is. The data show technological actors have reasonable variances over raters, are intuitively related to sentiments of other technologies, and vary a noteworthy amount on regular use or ownership, but not much on general technology enculturation. In sum these analyses demonstrate that the cultural sentiments of technology terms display similar properties to non-technology terms.

Based on this I believe that ACT can be expanded into the realm of technology. Establishing an affect control theory of technology, however, does not imply empirical similarity with the parent version of the theory. A difference in human-human and human-technology interaction could be found in the following two questions. First, do human-technology interactions follow the same cultural norms as specified in the human-human transient impression equations? Second, do observers of human-technology interactions try to maintain a stable definition of the situation (i.e., the affect control principle) as they would for human-human interactions? These questions now can be investigated empirically due to this instantiation of an affect control theory of technology. Further, the dictionary of cultural sentiments can provide a basis for theoretical simulations of human-technology interaction allowing new research questions to be explored.

REFERENCES

Brave, Scott, Clifford Nass, and Kevin Hutchinson. 2005. "Computers that Care: Investigating the Effects of Orientation of Emotion Exhibited by an Embodied Computer Agent." *International Journal of Human-Computer Studies* 62:161-178.

Britt, Lory and David R. Heise. 1992. "Impressions of Self-Directed Actions." *Social Psychology Quarterly* 55:335-350.

Burke, Peter J. and Jan E. Stets. 2009. *Identity Theory*: Oxford University.

Ferdig, Richard E. and Punya Mishra. 2004. "Emotional Responses to Computers: Experiences in Unfairness, Anger, and Spite." *Journal of Educational Multimedia and Hypermedia* 13:143-161.

Heise, David R. 1979. *Understanding Events: Affect and the Construction of Social Action*. New York: Cambridge University Press.

—. 2007. *Expressive Order: Confirming Sentiments in Social Actions*. New York: Springer.

—. 2009. "Interact." http://www.indiana.edu/~socpsy/ACT/interact.htm.

—. 2010. *Surveying Cultures: Discovering Shared Conceptions and Sentiments*: Wiley.

Isbister, Katherine and Clifford Nass. 2000. "Consistency of Personality in Interactive Characters: Verbal Cues, Non-Verbal Cues, and User Characteristics." *International Journal of Human-Computer Studies* 53:251-267.

King, Adam B. 2001. "Affective Dimensions of Internet Culture." *Social Science Computer Review* 19:414-430.

Kroska, Amy and Sarah K. Harkness. 2006. "Stigma Sentiments and Self-Meanings: Exploring the Modified Labeling Theory of Mental Illness." *Social Psychology Quarterly* 69:325-348.

Kurzweil, Ray. 2000. *The Age of Spiritual Machines: When Computer Exceed Human Intelligence*. New York: Penguin.

MacKinnon, Neil J. and David R. Heise. 2010. *Self, Identities, and Social Institutions*.

Nass, Clifford and Youngme Moon. 2000. "Machines and Mindlessness: Social Responses to Computers." *Journal of Social Issues* 56:81-103.

Osgood, Charles E., W. E. May, and M. S. Miron. 1975. *Cross-Cultural Universals of Affective Meaning*. Urbana: University of Illinois.

Robinson, Dawn T. and Lynn Smith-Lovin. 2006. "Affect Control Theory." in *Social Psychology*, edited by P. J. Burke. Stanford: Stanford University Press.

Smith-Lovin, Lynn and William Douglass. 1992. "An Affect-Control Analysis of Two Religious Groups." in *Social Perspectives on Emotion*, edited by D. D. Franks and V. Gecas. Greenwich, Connecticut: Jai Press.

Stryker, Sheldon. 1980. *Symbolic Interactionism: A Social Structural Version*, Edited by J. F. J. Short. Menlo Park, CA: Benjamin/Cummings.

Thomas, Lisa and David R. Heise. 1995. "Mining Error Variance and Hitting Pay-Dirt: Discovering Systematic Variation in Social Sentiments." *The Sociological Quarterly* 36:425-439.

Troyer, Lisa. 2004. "Affect Control Theory as a Foundation for the Design of Socially Intelligent Systems." in *American Association for Artificial Intelligence Symposium on Architectures for Modeling Emotion: Cross Disciplinary Foundations*. Menlo Park, CA: AAAI Press.

Vishwanath, Arun and Hao Chan. 2006. "Technology Clusters: Using Multidimensional Scaling to Evaluate and Structure Technology Clusters." *Journal of the American Society for Information Science and Technology* 57:1451-1460.

APPENDIX A: AFFECT CONTROL THEORY TECHNOLOGY DICTIONARY

	Male				Female			
	E	P	A	N	E	P	A	N
Behavior								
1. To Cyber Attack	-3.00	0.93	1.33	30	-3.25	2.09	1.84	32
	(1.02)	(2.27)	(1.73)		(0.76)	(1.77)	(1.19)	
2. To Deactivate	-0.52	-0.26	-0.68	31	0.11	0.71	0.18	38
	(2.05)	(2.07)	(1.62)		(1.74)	(1.83)	(1.56)	
3. To Activate	1.44	1.06	0.97	29	1.74	1.50	1.15	34
	(1.26)	(1.25)	(1.17)		(1.46)	(1.60)	(1.58)	
4. To Upgrade	2.31	1.59	1.82	39	2.79	1.98	1.88	48
Something	(1.26)	(1.29)	(1.37)		(1.50)	(1.54)	(1.55)	
5. To Update	2.44	1.19	1.08	36	2.86	1.70	1.66	50
Something	(1.61)	(1.89)	(1.76)		(1.14)	(1.37)	(1.66)	
6. Provide Output To	1.85	1.15	1.12	26	1.40	0.50	0.6	20*
	(1.43)	(1.38)	(1.45)		(1.73)	(0.89)	(1.23)	
7. To Freeze (as in a	-3.24	0.08	-2.16	37	-3.52	0.00	-2.43	54
computer freezes)	(0.95)	(2.35)	(1.80)		(1.06)	(2.83)	(1.66)	
8. Run Analysis	1.50	0.82	0.68	22*	2.08	0.75	0.25	12*
	(1.47)	(1.33)	(1.76)		(1.31)	(1.42)	(0.87)	
9. To Crash (as in a	-3.57	1.59	0.08	37	-3.71	2.37	0.17	49
computer crashes)	(0.73)	(2.68)	(2.47)		(0.65)	(2.09)	(2.28)	
10. Coerce	-0.32	1.54	0.54	28	-0.79	1.39	0.18	33
	(2.23)	(1.55)	(1.69)		(1.56)	(1.62)	(1.40)	
11. To Exchange	2.28	1.28	1.00	29	2.21	1.29	0.82	38
With	(1.46)	(1.69)	(1.83)		(1.28)	(1.45)	(1.52)	
Human Actors								
12. Human	1.21	1.08	0.74	38	2.19	1.61	0.74	54
	(1.89)	(1.57)	(1.18)		(1.66)	(1.83)	(1.36)	
13. Yourself	2.05	0.93	1.20	40	2.90	0.75	2.08	48
	(1.48)	(1.44)	(1.57)		(1.17)	(1.78)	(1.60)	
14. Student	1.82	-0.05	1.89	38	2.45	0.55	2.36	47
	(1.20)	(1.72)	(1.47)		(1.63)	(1.85)	(1.39)	
15. Internet Stalker	-3.36	-0.15	-0.79	39	-3.73	1.08	0.00	48
	(0.93)	(1.99)	(1.94)		(0.57)	(2.24)	(2.03)	
16. Internet Predator	-3.54	0.49	-0.97	37	-3.86	1.63	0.24	51
	(1.35)	(2.27)	(2.24)		(0.60)	(1.74)	(2.06)	
Computer Actors								
17. Computer	2.67	2.36	2.03	39	3.23	2.40	2.38	48
	(1.44)	(1.72)	(1.91)		(0.93)	(1.43)	(1.38)	
18. Desktop	1.39	1.18	0.55	38	1.49	1.45	0.18	55
Computer	(1.98)	(1.77)	(2.05)		(1.98)	(1.79)	(2.20)	
19. Laptop	3.14	1.41	2.03	37	3.64	2.32	2.74	50
Computer	(1.03)	(1.59)	(1.72)		(0.60)	(1.46)	(1.32)	
20. Macintosh	2.19	0.97	1.95	37	2.96	2.43	2.60	47
Computer	(1.87)	(2.27)	(1.72)		(1.10)	(1.57)	(1.66)	

21. Microsoft Windows Computer	1.49 (2.33)	1.32 (2.11)	0.68 (2.11)	37	2.35 (1.65)	1.80 (1.83)	1.16 (1.91)	49
TV and Camera Actors								
22. VCR	-0.42 (1.76)	-1.42 (1.67)	-2.39 (1.53)	38	0.24 (1.93)	-1.13 (1.47)	-2.35 (1.53)	55
23. DVD Player	2.17 (1.34)	0.72 (1.60)	1.33 (1.57)	36	3.23 (0.88)	1.29 (1.87)	2.10 (1.22)	48
24. TV Recording Device (such as Tivo or DVR)	2.38 (1.69)	1.54 (1.59)	2.14 (1.48)	37	3.10 (0.95)	1.63 (1.58)	2.21 (1.35)	48
25. HD TV (High Definition TV)	2.77 (1.51)	2.41 (1.63)	2.64 (1.65)	39	2.84 (1.31)	2.41 (1.43)	2.57 (1.41)	49
26. Digital Camera	3.00 (1.01)	0.63 (1.92)	1.66 (1.88)	38	3.55 (0.71)	1.41 (2.00)	2.10 (1.53)	49
27. Digital Camcorder	2.50 (1.40)	0.03 (1.83)	1.53 (1.50)	34	2.76 (1.08)	0.96 (1.51)	1.42 (1.39)	50
Audio Device Actors								
28. Landline Phone	-0.31 (2.31)	-1.31 (1.69)	-2.03 (1.68)	39	1.06 (1.81)	-0.65 (1.82)	-1.29 (2.03)	48
29. Cellular Phone	3.03 (1.40)	1.49 (2.30)	2.27 (1.82)	37	3.20 (1.40)	2.14 (1.71)	2.80 (1.25)	51
30. Fax Machine	0.90 (2.07)	0.00 (1.96)	-0.56 (2.10)	39	1.40 (2.05)	0.27 (1.98)	-0.60 (2.20)	48
31. Cassette Tape Player	-0.93 (2.37)	-2.30 (1.54)	-2.80 (1.22)	40	-0.77 (2.27)	-2.36 (1.37)	-2.85 (1.50)	47
32. CD Player	0.84 (2.25)	-0.65 (1.95)	-0.16 (2.58)	37	1.61 (1.55)	-0.24 (1.62)	-0.41 (2.13)	51
33. Digital Audio Player (such as an iPod or MP3 player)	3.15 (1.04)	1.56 (2.11)	2.38 (1.71)	39	3.35 (0.76)	1.38 (1.88)	2.56 (1.25)	48
34. AM Radio	0.34 (2.34)	-1.34 (2.06)	-1.76 (2.09)	38	-0.83 (2.09)	-1.53 (2.00)	-2.26 (1.75)	47
35. FM Radio	2.03 (1.42)	0.57 (1.83)	0.65 (2.02)	37	2.11 (1.73)	0.53 (1.97)	0.13 (1.96)	53
36. Internet Radio	1.77 (1.85)	0.37 (2.13)	1.43 (1.90)	35	2.59 (1.57)	0.98 (1.82)	2.02 (1.64)	49
Vehicle Actors or Settings								
37. Bicycle	2.20 (1.38)	-0.60 (1.74)	0.15 (1.82)	40	2.48 (1.43)	-0.52 (2.18)	-0.56 (2.22)	48
38. Motorcycle	1.63 (1.72)	2.10 (1.48)	2.98 (1.14)	40	0.65 (2.18)	1.42 (1.57)	2.65 (1.18)	48
39. Car	2.08 (1.65)	1.42 (1.57)	1.05 (1.68)	38	2.92 (1.17)	2.22 (1.33)	1.92 (1.47)	49

40. Sports Car	1.92 (2.33)	2.54 (1.73)	3.19 (1.13)	37	2.35 (1.73)	2.14 (1.69)	3.41 (0.85)	51
41. Pickup Truck	0.65 (2.14)	2.16 (1.55)	0.51 (2.29)	37	0.57 (2.09)	2.06 (1.57)	0.37 (2.31)	51
42. SUV (Sports Utility Vehicle)	-0.08 (2.68)	2.61 (1.35)	1.24 (1.62)	38	0.86 (2.36)	3.08 (1.08)	1.76 (1.88)	49
43. Non-Hybrid Vehicle	0.32 (1.80)	1.39 (2.03)	0.79 (2.03)	38	0.02 (1.98)	1.43 (1.58)	0.61 (1.91)	49
44. Hybrid Vehicle	3.05 (1.38)	0.13 (2.41)	0.77 (2.11)	39	3.24 (0.97)	1.24 (1.98)	1.90 (1.54)	49
45. School Bus	1.45 (2.36)	2.13 (1.70)	-0.47 (2.50)	38	0.76 (2.22)	1.12 (1.96)	-0.94 (1.99)	51
46. Semi Truck	-0.27 (1.87)	2.70 (1.54)	0.38 (2.24)	37	-0.70 (1.92)	2.32 (1.82)	0.30 (2.20)	47
47. Minivan	-0.39 (1.78)	0.82 (1.52)	-1.50 (1.62)	38	-0.94 (2.01)	-0.19 (2.10)	-1.69 (1.69)	54
48. Ambulance	2.78 (1.18)	2.14 (1.23)	2.92 (1.46)	37	2.87 (1.80)	3.15 (1.00)	3.09 (1.10)	54
49. Fire Truck	2.67 (1.56)	2.90 (1.35)	2.36 (1.55)	39	3.06 (1.07)	3.12 (1.09)	2.53 (1.49)	49
50. Police Car	0.41 (2.31)	1.84 (1.85)	1.43 (1.64)	37	0.62 (2.32)	1.76 (1.46)	1.38 (1.77)	50
Military Actors								
51. Car Bomb	-3.63 (0.74)	2.43 (2.24)	1.80 (1.84)	40	-3.87 (0.40)	3.30 (1.23)	2.19 (1.50)	47
52. Suicide Bomb	-3.67 (0.66)	3.05 (1.95)	2.13 (2.04)	39	-3.85 (0.50)	3.10 (1.80)	1.98 (1.79)	48
53. Roadside Bomb	-3.89 (0.39)	3.11 (1.97)	1.84 (2.24)	38	-3.89 (0.38)	3.35 (1.18)	2.24 (1.85)	46
54. Tank (as in the military vehicle)	0.15 (2.38)	3.03 (1.67)	1.08 (2.39)	40	-0.46 (2.25)	3.46 (1.05)	1.00 (2.46)	46
55. Missile	-1.51 (1.94)	2.85 (1.50)	1.92 (1.95)	39	-2.27 (1.75)	3.44 (1.15)	2.52 (1.70)	48
56. Weapon of Mass Destruction	-3.37 (1.13)	3.61 (0.92)	2.21 (1.80)	38	-3.29 (1.57)	3.78 (0.66)	2.44 (1.65)	55
57. Nuclear Weapon	-2.62 (1.93)	3.73 (1.04)	2.05 (2.11)	37	-3.34 (1.18)	3.72 (0.70)	1.84 (1.72)	50
58. Biological Weapon	-3.08 (1.61)	3.59 (0.60)	1.41 (2.06)	37	-3.20 (1.32)	3.51 (0.84)	1.27 (2.55)	45
Websites								
59. EBay Website	1.62 (1.74)	1.54 (1.48)	1.41 (1.52)	37	2.76 (1.21)	2.48 (1.46)	2.30 (1.41)	46
60. Youtube Website	2.63 (1.22)	2.03 (1.90)	2.29 (1.35)	38	2.36 (1.83)	2.65 (1.31)	3.05 (1.15)	55
61. Wikipedia Website	2.33 (1.75)	2.03 (1.46)	1.74 (1.41)	39	2.04 (2.15)	1.45 (2.03)	1.41 (1.54)	49

62. Facebook Website	2.18 (2.10)	2.08 (2.17)	2.68 (1.68)	38	2.41 (1.78)	2.49 (1.38)	2.78 (1.45)	51
63. Myspace Website	-0.42 (2.14)	0.50 (2.05)	0.71 (2.14)	38	-0.47 (2.52)	1.28 (1.93)	1.60 (2.21)	47
64. Yahoo Website	1.38 (2.15)	0.81 (2.45)	0.57 (2.12)	37	1.53 (1.77)	1.24 (1.88)	0.94 (1.61)	49
65. Google Website	3.00 (1.01)	2.90 (1.35)	2.23 (1.54)	40	3.40 (0.79)	3.00 (1.27)	2.77 (1.19)	48
66. Google Earth Website	2.94 (1.15)	2.44 (1.52)	2.00 (1.76)	34	2.43 (1.48)	2.40 (1.48)	1.83 (1.72)	42
Software								
67. Network Firewall	1.43 (2.13)	1.60 (1.38)	0.37 (2.03)	35	2.26 (1.73)	1.79 (1.61)	0.71 (1.49)	38
68. "Webpage Not Available" Error	-2.82 (1.29)	-0.95 (2.16)	-1.63 (1.63)	38	-3.24 (0.95)	-0.28 (2.72)	-1.31 (2.14)	54
69. Spam Email	-3.39 (0.86)	-0.71 (2.30)	-0.13 (2.34)	38	-3.49 (1.10)	-0.31 (2.44)	-0.08 (1.90)	51
70. Computer Virus	-3.58 (0.64)	1.48 (2.90)	0.78 (2.33)	40	-3.88 (0.39)	3.04 (1.37)	0.90 (2.02)	49
71. Antivirus Computer Program	2.15 (1.73)	1.38 (1.52)	0.51 (1.85)	39	2.72 (1.78)	1.62 (1.97)	1.23 (1.58)	47
72. Spyware	-2.00 (2.81)	1.57 (1.98)	0.73 (2.36)	37	-0.17 (2.97)	2.07 (1.81)	1.51 (1.61)	41
73. Spyware Removal Programs	2.61 (1.52)	0.81 (2.19)	0.86 (1.96)	36	2.55 (1.48)	1.45 (1.77)	0.71 (1.80)	42
Miscellaneous								
74. ATM (Automatic Teller Machine)	2.48 (1.41)	1.30 (1.73)	1.18 (1.69)	40	3.22 (1.03)	1.49 (1.95)	1.10 (2.30)	49
75. GPS (Global Positioning System)	2.66 (1.30)	1.66 (2.00)	1.55 (1.81)	38	3.06 (0.99)	2.06 (1.71)	1.98 (1.44)	47
76. PDA (Personal Digital Assistant)	2.00 (1.53)	0.20 (1.86)	1.54 (1.52)	35	2.50 (1.37)	1.55 (1.45)	2.10 (1.62)	42
77. Robot	1.16 (1.55)	0.97 (1.84)	0.84 (1.84)	38	1.38 (1.76)	1.51 (1.39)	1.73 (1.74)	45
78. Android	0.77 (1.75)	1.35 (1.38)	1.39 (1.63)	31	0.50 (1.93)	1.42 (0.90)	1.50 (1.17)	12*
79. Biotechnology	2.32 (1.77)	1.71 (1.61)	0.97 (2.18)	34	2.57 (1.42)	2.31 (1.35)	1.66 (1.75)	35
80. Artificial Limb	2.94 (1.66)	0.67 (1.99)	0.48 (1.97)	33	2.96 (1.52)	1.24 (1.68)	0.11 (1.91)	46

Note: Mean values are first, with standard deviations in parenthesis.
*Less than the minimum of 26 needed to consider it a reliable value

APPENDIX B: QUESTIONS ON TECHNOLOGY USE

Circle any of the following that you own or use regularly:

Cellular Phone, HD-TV, DVD (or Blu-Ray) Player, Vehicle, Gaming System, Laptop Computer, Desktop Computer, PDA, Tablet Computer, Digital Music Player, GPS, DVR/Tivo

Circle any of the following that you go to regularly:

Internet Radio Station, Myspace, Google, Google Earth, Yahoo, Facebook, E-Bay, Wikipedia, YouTube

AUTHOR'S NOTE

Special thanks to Dawn T. Robinson, Jesse Clark, Tiffani Everett, Laura Aikens, and Evander Baker for help in refining this project from its conception to the current draft of this paper.

AUTHOR BIOGRAPHY

Daniel B. Shank is a sociology PhD candidate at the University of Georgia. His primary interests include social psychology, emotions, group processes, and human-technology interaction. Recent projects include a laboratory experiment in human-computer interaction building on affect control theory, social exchange theory, and interactional justice perspectives. His dissertation extends this work by considering emotions in response to computers that represent organizations. For this he draws from affect control theory and the affect theory of social exchange. (DBShank@uga.edu)