APPLICATION OF SATISFACTION THEORY TO A PREDICTED EVENT: THE Y2K COMPUTER PROBLEM

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ABSTRACT

This study applies expectations based disconfirmation models of satisfaction to the unusual case of the Y2K computer bug. Four possible determinants of satisfaction were investigated: the moderating role of knowledge, the disconfirmation of expectations paradigm, level of involvement, and the view of technology. Subjects selected in a random sampling procedure were interviewed both before and after January 1, 2000. Results indicated only positive disconfirmation, e.g., the actual event was perceived by the subjects to be better than that which was expected. Few significant correlations between satisfaction with Y2K problems and other factors were found. Only "view of technology" was negatively and significantly correlated with satisfaction.

INTRODUCTION

On the cover of an issue of *Time* magazine (Lacayo, 1999, January 18) devoted to the Y2K problem, the message on a sandwich board asked, "The End of the World!?!" Beginning with a lone scientist in 1979 (Taylor, 1999), experts and laypeople alike predicted disaster of various magnitudes when our millennial clock turned from 12-31-99 to 01-01-00. These expectations were based upon the fact that when computers were in their infancy, dates were recorded as six-digit numbers; so January 26, 1968, was recorded in the computer memory as 01-26-68. Therefore, January 1, 2000, would appear to a computer to be the same date as January 1, 1900.

During the last several years of the twentieth century, this event loomed before us, capturing the attention of much of the public. Based upon the widespread preparations for and speculation about Y2K, the authors thought it would be interesting to apply satisfaction theory to this predicted event. Some provocative research questions emerged. If we expect the worst, and it actually happens, are we satisfied? Is it similar to being terrified while riding on terrifying rides at an amusement park? Does one feel vindicated, saying, "I just knew that was going to happen?" Alternately, if we have negative expectations yet nothing bad happens, will we be dissatisfied? The purpose of this study was to apply expectations based disconfirmation models of satisfaction to the unusual case of the Y2K computer problem.

The Setting

Governments and industry expended a great deal of effort and money to ensure that critical computer systems, such as air traffic control, the military, and financial institutions were properly "debugged" (MacGregor, 2000). Although it may be impossible to estimate the amount of money and resources spent on preparation for Y2K, estimates in the media have suggested that $100 billion was spent in the United States alone and possibly $450 billion was spent on a world wide basis (MacGregor, 2000).

Some of humankind seemed worried about greeting the new millennium in the dark, though many were unaware of the possibility of chaos. In fact, what actually happened was almost nothing. The biggest problem many people had was using up all of that extra canned tuna fish and other staples they had stockpiled (Levy, 2000). The millennium bug did not bite. There were very few glitches in any of the computer-related devices upon which we all rely. Many in the computer field claim that the absence of serious problems was due to the fact that most of the best minds available were put to work on solving the problem years ahead of the impending event. They succeeded in fixing almost all of the predicted

problems caused by the date change before the deadline date.

Many people in many nations stockpiled food, cash, and supplies, though this phenomenon was more common in the U.S. than elsewhere (O'Neill, 1999). And among certain groups there was undeniably a Second-Coming, millennialist theme to the preparations and to the countless religious tracts which were produced about the subject (O'Neill, 1999). Even those with no stated religious view saw the impending disaster in a theological light (von Hoffmann, 1999). Articles about Y2K in the popular press increased in number as the millennium approached. Between November, 1997, and March, 2000, there were 258 mentions in a major West Coast metropolitan newspaper, reaching a monthly maximum of 62 articles in December, 1999 (Grobe, 2002). An analysis of the Y2K-related articles appearing during this time period in this newspaper (Grobe, 2002) indicated that the most frequent type of article (23%) concerned the status of Y2K preparedness among government and business firms. The next most common Y2K-related article (16%) concerned the preparedness of the general public, and the third most common type of article (12%) concerned consumer expectations about problems caused by the computer bug. Other broad categories represented in articles in this newspaper were personal money issues, costs related to fixing the Y2K bug, concern about widespread panic, threats to small businesses, predictions of outcomes, industry growth selling Y2K-related products, and concerns with air transportation.

Conceptual Framework and Model

In the past, researchers have studied the possible antecedents of satisfaction, such as expectations and the level of involvement with the product or event. After searching the popular press on Y2K and consumer satisfaction literature for clues about satisfaction/dissatisfaction with the preparation for and the response to the Y2K phenomenon and what factors might predict satisfaction/dissatisfaction, we chose to focus on four possible determinants that seemed to be worth investigating: the moderating role of knowledge, the confirmation of expectations paradigm, the level of involvement, and the view of technology.

The Moderating Role of Knowledge. De Ruyter & Bloemer (1997) found that consumers with greater knowledge about a particular subject have more distinct expectations than consumers with lesser knowledge. Therefore, they view knowledge as playing a mediator role between expectations and customer perceived service. Because of the extensive popular press coverage of Y2K, we believed that consumers had been exposed to a great deal of information on this problem such that it would be likely to inform their expectations and influence their decisions regarding the event.

The Disconfirmation of Expectations Paradigm. Is a major adverse scenario an appropriate event to which to apply the expectations paradigm of satisfaction/ dissatisfaction? To what extent is the Y2K millennium computer problem a special case? If one expects a negative outcome but it does not occur, would the expectation be negatively disconfirmed or positively disconfirmed? We consider this unusual situation to be of interest particularly because nearly all satisfaction research is positively oriented.

Level of Involvement. Another factor considered to be related to satisfaction is the individual's level of involvement with the event, product, or service. Studies reported in the consumer satisfaction literature linking level of involvement with satisfaction include Zaichovsky (1985), Richins and Bloch (1991), Park and Choi (1998) and Celuch and Taylor (1999).

From an involvement point of view, it might be argued that satisfaction with the outcome of the Y2K problem may be related to how much money and effort one spent on preparation for it. If one spent little or nothing (because of expectations or because of lack of knowledge or interest), one had very little stake in the outcome, and therefore might be predicted to be neither highly satisfied nor highly dissatisfied because of low

involvement. On the other hand, if one read lots of predictions about Y2K, prepared for the worst case scenario, and then discovered that virtually nothing happened, through the disconfirmation process one might be expected to form definite feelings of satisfaction or dissatisfaction.

The View of Technology. It might be posited that one's confidence about the role of computers and related technology in one's life would correlate with satisfaction with preparation for, and outcomes of, Y2K. Being comfortable with, or resigned to, the predominance of computers in our lives may increase confidence in the ability of computers and computer scientists to solve any problems encountered in preparing for Y2K.

METHODS

The Y2K issue differed from natural disasters such as earthquakes or tsunamis because its timing was known precisely. People anticipated it and made plans for it well before the actual event. Unlike much previous research about consumer satisfaction (e.g., Voss et. al, 1998), the study herein was not based on an experimental model. This study of the Y2K problem was planned within the context of the real event.

Respondents

The data were collected in two waves, as described: (1) a Pre-Survey conducted by telephone between November 18 and December 4, 1999, by a survey research laboratory at a university; and (2) a Post-Survey administered by telephone between January 4 and January 9, 2000, by the researchers and trained assistants at a different university. Pre-Survey respondents who said they were willing to answer further questions about Y2K comprised the Post-Survey respondents.

Variables

The key variables were derived from the expectations paradigm, satisfaction literature, and our understanding of the Y2K phenomenon. The variables were knowledge, expectations, level of involvement, and view of technology. These variables were operationalized as follows:

Knowledge was based on asking those respondents who were aware of Y2K (94% of Pre-Survey sample) whether they had "heard or read a little, some, or a great deal" about Y2K (little=1; great deal=3).

Expectations was operationalized by a categorical variable equal to one if the respondent expressed no anticipated computer mistakes due to the Y2K issue, equal to two if they anticipated minor problems, and equal to three if they anticipated major problems.

Level of involvement was measured by asking respondents about their preparation for potential Y2K problems (none=1; plan to take action=2; took action=3).

View of technology was operationalized by an indicator variable equal to one if the respondent had a favorable opinion about the use of computer technology in our society today, and equal to zero if he/she did not.

Satisfaction was measured in the Post-Survey by asking respondents (1) to indicate their level of satisfaction with the number of Y2K problems they experienced, (2) how satisfied they were with the preparations they made for Y2K and (3) their level of satisfaction with the information they received about preparing for the Y2K computer problem. A 7-point, Likert-like scale (delighted=1; terrible=7) was used for all three variables.

Pre-Survey

The target population was all adults over the age of eighteen in a Northwestern U.S. state. A pretest was performed in mid-November, 1999. The survey instrument was revised based on interviewers' and pretest respondents' input. The

Pre-Survey interviews were conducted using a Computer-Assisted Telephone Interview (CATI) system. Telephone calls were made at all times of day and evening, including weekends. However, most interviews were completed in the evening and on weekends. To avoid nonresponse bias, a minimum of 15 calls was made to each working, randomly-selected telephone number.

The data collection resulted in 420 completed surveys from randomly selected households (Table 1). Interviews were conducted with the person identified as a household resident "who is age 18 or older." The response rate for the entire sample frame was 57.6%. Only respondents who were aware of the Y2K computer bug problem (94% of entire sample) were asked to respond to the entire Pre-Survey. Respondents unaware of the millennium bug (6% of the entire sample) were asked to provide only their demographic information.

Table 1
Sample Sizes and Response Rates

	Sample Size	*Response Rate*
Pre-Survey	420	57.6%
Post-Survey	342	76.6%
Subsample of Respondents who Completed both the Pre and Post-Surveys	262	-

Post-Survey

At the completion of the Pre-Survey, interviewers asked the respondents whether they would be willing to answer further questions on Y2K after January 1, 2000.

The Post-Survey sampling frame consisted of the 342 respondents from the Pre-Survey who said they were willing to answer further questions (Table 1). A total of 262 interviews averaging 2 minutes in length were completed between January 4 and 9, 2000. The adjusted response rate for the Post-Survey was 76.6%. Fifty-five percent of the Post-Survey sample respondents were female. The typical respondent was 53 years of age, with an average household size of 2.66 persons. The median income of the respondents was $35,000 to $50,000, and forty-four percent of the respondents had at least some college education.

RESULTS

Pre-Survey Findings

The eligibility criterion in the Pre-Survey was: "have your heard or read anything about the Y2K computer bug problem?" Nearly all, 94%, of the respondents were aware of Y2K. Those who were not aware of it were asked only demographic questions and were not included in the Pre-Survey sample. It is interesting to note that of the 24 respondents who were not aware of Y2K, 86% identified themselves as very or extremely religious, as opposed to only 57% of the respondents who were aware.

As the millennium approached, media involvement was high (MacGregor, 2000). Eighteen percent (n=47) of the 262 respondents reported having received a little information, 34.7% (n=91) reported receiving some information, and 46.9% (n=123) reported having received a great deal of information about the Y2K computer bug (see Table 2).

When asked whether they anticipated potential computer problems due to Y2K, 36.2% (n=95) of the respondents replied that they expected no problems, 59.1% (n=155) expected minor problems, and 2.2% (n=6) expected major problems (see Table 2). Thus, 98.3% expected no problems or minor problems, so expectations were that there would be no major problems.

When asked if respondents had taken or plan to take any steps "to prepare yourself or your family for potential Y2K problems," 36.6% (n=96) of the respondents reported having no plans, 16.7% (n=44) of the respondents planned to take steps, and 45.0% (n=118) had already taken some action to prepare (see Table 2). Thus, while only 2.2% expected major problems, 45% had taken some actual action to prepare themselves . To the extent that "actions speak louder than words" 45% had a strong enough expectation of problems that they took special steps to prepare.

In response to the question, "do you have a

Table 2
Summary Statistics (n=262)

Measurement	*Frequency*	*Percentage*
Knowledge		
"Would you say you have heard or read a little, some, or a great deal?"		
Little	47	17.9%
Some	91	34.7
A great deal	123	46.9
Don't know/No answer	1	<1
Expectations		
"Do you anticipate that potential computer mistakes due to the Y2K issue will cause major problems, minor problems, or no problems at all for you personally?"		
No problems	95	36.2%
Minor problems	155	59.1
Major problems	6	2.2
Don't know/No answer	5	1.9
Level of Involvement		
Have you taken or plan to take any steps "to prepare yourself or your family for potential Y2K problems"		
No plans	96	36.6%
Plan to take steps	44	16.7
Took action	118	45.0
Don't know/No answer	4	1.5
View of Technology		
"Do you have a favorable or unfavorable opinion about the use of computer technology in our society today?"		
Favorable	215	82.0%
Unfavorable	40	15.2
Don't know/No answer	7	2.6

favorable or unfavorable opinion about the use of computer technology in our society today?" 82.0% (n=215) of the respondents reported favorable opinions, and 15.2% (n=40) reported unfavorable opinions (see Table 2).

Post-Survey Findings

In the Post-Survey, respondents were asked whether they had experienced any problems as a result of the Y2K computer bug. Only 5 respondents reported any problems. The problems that were reported included the loss of home accounting records on one respondent's home computer, a cell phone that went dead, and a local cable access channel reader board that read January 5, 1990. One respondent indicated trouble prior to January 1, 2000: "I had an insurance bill which kept showing it was unpaid because the company was updating its computers for Y2K." Another comment by a respondent reflected disappointment in what did not happen: "I was

disappointed that utilities didn't have problems which would cost them profits." It is possible that this attitude reflects a grudge, which suggests another avenue of research. Overall, very few incidents were actually attributed by the respondents to the Y2K computer problem.

As part of the Post-Survey, respondents also were asked to respond to several items about their satisfaction with the outcome of the Y2K computer problems they had expected to occur (see Table 3). First, respondents were asked to indicate their overall satisfaction with the number of Y2K problems they experienced. On a scale of 1 (delighted) to 7 (terrible), the mean response for satisfaction with the number of problems was 1.11 (sd=.48). Respondents in this study reported a very, very high degree of satisfaction with the number of Y2K problems they experienced. The respondents to this survey experienced almost no problems as a result of Y2K, and they were delighted that such was the case. So, rather than forming negative assessments of a problem-free experience that was contrary to the problem-laden experience that was expected (see Table 2), positive assessments were formed. Second, the 282 respondents were asked to indicate howsatisfied they were with the preparations they made for Y2K (see Table 3). The mean response for satisfaction with preparations was 1.39 (sd=1.11). That is, respondents reported a very high level of satisfaction with the preparations they had made for Y2K. Table 2 indicates that 45% of the respondents had taken steps to prepare for Y2K problems. Rather than forming negative evaluations of their preparation efforts, positive assessments were formed. Third, respondents were asked about their satisfaction with the information about Y2K which they received. The mean response for satisfaction with information was 2.37 (sd=1.85) (see Table 3). During the Post-Survey phone interviews, a number of the respondents indicated that they believed that generally there had been too much media attention to the Y2K computer bug, especially in light of the fact that almost nothing had gone wrong. A greater degree of dissatisfaction with the amount of information about Y2K had been expected than was observed among these respondents. Perhaps this finding is reflective of a sense of relief at escape from potential disaster.

A preliminary analysis indicates few significant correlations between satisfaction with Y2K problems and other factors (Table 4). Only "view of technology" was negatively and significantly correlated (-0.224) with satisfaction. That is, those who had a favorable opinion of

Table 3
Summary Statistics for Satisfaction Measures (n=262)

Measurement	*Mean*	*Standard Deviation*
Overall Satisfaction On a scale of 1 to 7, with 1 being delighted and 7 being terrible, how satisfied are you overall with the amount of Y2K problems you experienced?	1.11	0.48
Satisfaction with Preparation On a scale of 1 to 7, with 1 being delighted and 7 being terrible, how satisfied are you with the preparations you made for Y2K?	1.39	1.11
Satisfaction with Information On a scale of 1 to 7, with 1 being delighted and 7 being terrible, how satisfied are you with the information you received about preparing for the Y2K computer bug?	2.37	1.85

Table 4
Correlation Matrix

	knowledge	expectations	involvement	view of technology	satisfaction	satisfactio w/ prep	satisfaction w/ info	gender	age	education	hhsize	religion	income
knowledge	1	-0.022	0.105	0.073	-0.064	-0.077	0.024	-0.126	0.101	0.083	-0.115	-0.057	-0.083
expectations		1	0.347	-0.019	0.040	0.004	0.086	0.155	-0.109	-0.086	0.073	0.023	-0.014
involvement			1	-0.038	0.059	0.064	0.014	0.129	-0.010	-0.071	0.014	0.129	-0.040
view of technology				1	-0.224	-0.041	0.117	-0.029	-0.134	0.139	-0.034	-0.017	0.093
satisfaction					1	0.144	0.102	0.025	0.002	-0.029	0.008	-0.032	0.010
satisfaction w/ prep						1	0.199	-0.032	-0.177	-0.036	0.044	-0.011	0.019
satisfaction w/ info							1	-0.065	0.028	0.067	0.036	0.069	-0.083
gender								1	0.097	-0.128	-0.091	0.259	-0.166
age									1	0.072	-0.390	0.191	-0.004
education										1	-0.087	-0.051	0.331
hhsize											1	0.115	0.083
religion												1	-0.048
income													1

* Given most of the data is categorical, a correlation coefficient of 0.2 is considered fairly high. (Source: D. A. Hensher and L. W. Johnson, *Applied Discrete Choice Modeling* (Halsted, New York, 1981)).

Table 5
Anticipation of Problems and Preparedness Variable

Measurement	*Frequency*	*Percentage*
No problem expected		
No action planned	56	21%
Plan to take action	14	5
Took action	24	9
Minor problems expected		
No action planned	38	15
Plan to take action	29	11
Took action	86	33
Major problems expected		
No action planned	1	<1
Plan to take action	1	<1
Took action	4	2
Don't know/No answer	9	

technology were more likely to be delighted with the Y2K problems they experienced. Because the satisfaction responses were not normally distributed (i.e., 96% of the respondents indicated a 1 or 2 on the 7-point delighted to terrible scale), further statistical analysis of satisfaction predictors could not be performed.

Table 4 also indicates a positive and significant relationship between expectations and involvement (0.347). To investigate this relationship further, the researchers created a new variable by combining the extent to which respondents anticipated problems and the level of involvement/preparedness reported (Table 5). Twenty-one percent (n=56) of the respondents expected no problems and planned to take no action; and of the 6 respondents who anticipated major problems, 4 indicated that they had already prepared for Y2K. An interesting finding was that a relatively large number of respondents (n=86, 33% of sample) anticipated only minor problems but nevertheless took action to prepare for Y2K.

CONCLUSION

The primary purpose of this study was to examine reported satisfaction in the condition when a negative outcome was expected but did not occur, with the specific setting being the non-occurrence of Y2K problems. Were people satisfied that no problems occurred or were they dissatisfied because actual was contrary to expected? In the context of the new millennium and the much hyped and anticipated Y2K problem, the researchers had raised the question of whether, in fact, people might actually be dissatisfied with the occurrence of no problems, particularly if they had made advance preparations. Respondents in this study reported very high levels of satisfaction, or positive disconfirmation, with an experienced outcome that was contrary to that which they had expected.

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