An Empirical Field Study of the Yield Shift Theory of Satisfaction

Robert O. Briggs  
San Diego State University  
rbriggs@mail.sdsu.edu

Bruce A. Reinig  
San Diego State University  
breinig@mail.sdsu.edu

G.J. de Vreede  
University of Nebraska at Omaha  
gdevreede@unomaha.edu

Abstract

Stakeholders who experience dissatisfaction with a system, even for reasons unrelated to its technology, may decline to adopt it or may abandon it even if there is clear evidence of substantial benefit from its continued use. Yield Shift Theory (YST) proposes a causal explanation for the onset, magnitude, and direction of satisfaction responses. This study of 282 professional knowledge workers in the field doing technology-supported work on real problems finds that the satisfaction responses of the knowledge workers are consistent with the relationships proposed by YST. The relationships held for both causal constructs of YST: shifts-in-utility and shifts-in-likelihood of goal attainment. The relationships held for two objects-of-satisfaction: work processes and work outcomes.

1. Introduction

Stakeholders who feel dissatisfied with an information system, even for reasons unrelated to its technology, may decline to adopt the system [1, 2], or may abandon it if [3, 4], even in the face of credible evidence of substantial benefit from its continued use. Satisfaction responses have therefore become a key indicator of system success [5]. A satisfaction response is an emotion, defined as a valenced affective arousal with respect to an object, having reference an individual’s goal(s) [6]. The term, satisfaction, is also applied to other constructs, for example, a judgment that needs have been satisfied and constraints have been met [e.g. 7]. This paper focuses on satisfaction-as-emotion.

Reports of satisfaction effects the IS literature are complex. Satisfaction responses to systems have been associated, for example, with individual differences [8] and perceptions [9], attitudes [10], and needs [11] to name but a few. People who feel satisfied with their early uses of a system do not necessarily remain satisfied [12]; and sometimes the most productive users are the least satisfied [13], but other times the most productive users are also the most satisfied [See e.g. 14, 15].

Table 1. Effects for Which a Theory of Satisfaction Should Account. From [6]

<table>
<thead>
<tr>
<th>Phenomenon</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Goal attainment effect</td>
<td>Individuals feel satisfied on attainment of a desired state or outcome. They feel dissatisfied when the desired state or outcome is thwarted.</td>
</tr>
<tr>
<td>2. Confirmation effect</td>
<td>Individuals feel satisfied when outcomes match expectations or desires, and feel dissatisfied when outcomes are less than expectations or desires.</td>
</tr>
<tr>
<td>3. Disconfirmation effect</td>
<td>Individuals feel neutral when outcomes match expectations or desires. They feel satisfied when outcomes exceed expectations or desires; they feel dissatisfied when outcomes are lower than expectations or desires.</td>
</tr>
<tr>
<td>4. Anticipation effect</td>
<td>Individuals feel satisfied or dissatisfied when thinking of future goal attainment, even though goals have not yet been attained or thwarted.</td>
</tr>
<tr>
<td>5. Nostalgia effect</td>
<td>Individuals feel satisfied or dissatisfied when thinking about past goal attainment or past failure to attain goals.</td>
</tr>
<tr>
<td>6. Differential effect</td>
<td>Multiple individuals manifest differing levels of satisfaction upon the attainment of goals to which they ascribe similar utility.</td>
</tr>
<tr>
<td>7. Hygiene effect</td>
<td>Individuals feel only neutral or negative about an IT/IS artifact, but never positive.</td>
</tr>
<tr>
<td>8. Mentor effect</td>
<td>Individuals feel more satisfied or dissatisfied after discussions with a trusted advisor, even though current conditions have not changed.</td>
</tr>
<tr>
<td>9. Mixed Feelings</td>
<td>Individuals experience both satisfaction and dissatisfaction with the same IS/IT artifact.</td>
</tr>
<tr>
<td>10. Attenuation effect</td>
<td>Individuals’ satisfaction responses diminish over time</td>
</tr>
</tbody>
</table>
Briggs, Reinig and Vreede [6] identified in the IS literature and in the field ten satisfaction effects for which a theory of satisfaction should account (Error! Reference source not found.) Authors have proposed several useful theoretical models to explain the complex variety of satisfaction responses in the IS literature, but none accounted for all ten effects. Goal attainment theories [16, 17], for example, predict that users will feel satisfied with a system to the extent that it advances them toward their salient goals, and will feel dissatisfied to the extent that a system thwarts goal attainment. Such theories have garnered empirical support [17], but could not account for confirmation effects. Confirmation theories [3] predict that users will feel satisfied when systems match or exceed expectations or desires, and predict dissatisfaction when outcomes do not meet expectations. These also have gained some empirical support [3] but could not account for disconfirmation and other effects in Table 1. Disconfirmation theories [18] propose that satisfaction will be positive when outcomes exceed expectations and desires, will be neutral when outcomes match expectations and desires, and will be negative when outcomes do not meet expectations and desires [19, 20]. Disconfirmation theories can account for goal attainment, confirmation, and disconfirmation effects, and can also explain hygiene and differential effects. However, disconfirmation theories can only account for satisfaction responses at the time outcomes are realized. They cannot account for effects that manifest well before and well after outcomes are known. Further, when expectations differ significantly from desires, disconfirmation theories yield paradoxically conflicting predictions.

Each theoretical approach contributed useful insights about satisfaction responses, but none accounted for the full variety of reported effects.

Yield Shift Theory (YST) [6] proposes a causal explanation for not only the effects described by prior models, but also for effects the earlier models did not describe or explain. To date, however, YST has not been subjected to rigorous empirical testing. If the logic of YST stands up to empirical scrutiny, it may become a useful tool for increasing the value stakeholders derive from information systems.

This paper reports a field study to explore the degree to the satisfaction responses of working professionals using technology-supported work practices are consistent with the causal relationships proposed by YST.

2. Yield Shift Theory

Yield Shift Theory is deductive nomological model to explain the onset, magnitude, and direction of satisfaction responses. Two kinds of statements comprise the theory: assumptions abducting mechanisms that could cause observed variations observed in satisfaction responses; and propositions, which are functional statements of cause-and-effect between causal and consequent constructs, that must be derivable from the assumptions by internally consistent deductive logic. We summarize YST’s key assumptions and propositions below. The complete logic is derived in [6].

YST posits that individuals hold multiple goals (desired states or outcomes), ranging from basic survival goals like drawing breath to esoteric self-actualization goals like achieving mastery of a musical instrument. The human mind, however, has limited cognitive resources, and so at a given moment can only process some subset of an individual’s goals. Goals currently the subject of cognitive processing are said to be active goals.

YST assumes that a cognitive mechanism automatically ascribes some level of utility to an active goal—a sense of how “good” it might be if the goal were to be attained. YST also assumes that a cognitive mechanism automatically assesses the likelihood that an active goal may be attained. YST further assumes that a cognitive mechanism synthesizes the yield for an active goal that is proportional to its utility, but reduced in inverse proportion to the likelihood of its attainment. Thus, an active goal with high utility but low likelihood could have a yield equivalent to a different active goal with low utility, but high likelihood.

YST’s first proposition is therefore:

P1: Perceived Yield. The yield of an active goal is a function of its perceived utility, moderated by the perceived likelihood of its attainment.

Figure 1 illustrates YST’s Proposition 1.

![Figure 1. YST Proposition 1. Perceived yield for an active goal is a function of the perceived utility of goal attainment, moderated by the perceived likelihood of goal attainment.](Utility Yield Likelihood)
and that it triggers an affective arousal proportional to the magnitude of the shift in yield, with a valence in the direction of the shift. An individual might simultaneously perceived a small negative shift in yield for one active goal, and larger positive shift in yield for another. The net yield shift for the set of active goals would be positive, and so, by the logic of YST, an affective arousal with a positive valence would manifest.

YST therefore proposes:

**P2. Yield Shift.** The magnitude of a satisfaction response is a function of the absolute value of yield shift for the set of active goals. The valence of a satisfaction response is equivalent to the direction of the yield shift.

Figure 2 illustrates YST’s Proposition 2.

Figure 2. YST Proposition 1. Satisfaction responses are a function of perceived shifts in yield for the set of active goals. The valence of the satisfaction response is in the direction of the perceived shift.

If the logic of YST holds, then there are several ways a user might experience a yield shift, and so a satisfaction response with respect to any aspect of a system, its use, or its outputs. For example:

1. **Change the perceived utility of attaining an active goal.** For example, a user might learn that a new financial analysis system also includes several faster and more reliable printers that will be available for general use. This might be perceived a positive utility shift, and so trigger a positive satisfaction response.

2. **Change the perceived likelihood of attaining an active goal.** For example, a stakeholder who would benefit from a proposed financial analysis system might hear a lukewarm comment about the system from an influential opinion leader, and so experience a negative likelihood shift, giving rise to a negative satisfaction response.

3. **Change the goals in the active set.** For example, a user might prefer not to implement a new esource tracking system that would create great value for the organization, but require a moderate increase in work load for users. A mentor might suggest that the event creates an opportunity to demonstrate leadership, and so build credibility toward a desired promotion. Removing the lower-yield work-load goal from the active set and replacing it with the higher-yield promotion goal would raise the yield for the set of salient goals, and so invoke a positive satisfaction response.

If the logic of YST holds, then users who perceive yield shifts during the conduct of technology-supported work should experience corresponding satisfaction responses. Such responses should emerge whether the yield shift was caused by a shift in utility or a shift in likelihood. Two key objects-of-satisfaction for technology-supported work would be the **work process** - the procedures and tools by which the work is conducted; and work **outcomes**, the products of the work. We therefore hypothesize:

**H1**: People who report more-positive yield shifts with respect to work processes will score higher on a measure of satisfaction with process than do people who report less-positive yield shifts.

**H2**: People who report more-positive yield shifts with respect to work outcomes will score higher on a measure of satisfaction with outcome than do people who report less-positive yield shifts.

2. **Methods**

To test YST in the field, we compiled and validated an instrument to measure the causal and consequent constructs of Yield Shift Theory in the context of technology-supported collaborative knowledge work.

2.1 **Dependent Variables**

We focused on two objects of satisfaction pertaining to technology-supported collaborative work: **satisfaction with process (SP)** and **satisfaction with outcome (SO)**. To measure SP and SO, we used two 5-item, five-point Likert scales that had been validated elsewhere [16, 21]. For both scales, a rating of 1 was anchored with “strongly disagree” and a rating of 5 was anchored with “strongly agree.” The items in the SP scale were:

1. I feel satisfied with the way in which today’s meeting was conducted.
2. I feel good about today’s meeting process.
3. I liked the way the meeting progressed today.
4. I feel satisfied with the procedures used in today’s meeting.
5. I feel satisfied about the way we carried out the activities in today’s meeting.
The items in the SO scale were:

1. I liked the outcome of today’s meeting.
2. I feel satisfied with the things we achieved in today’s meeting.
3. When the meeting was over, I felt satisfied with the results.
4. Our accomplishments today give me a feeling of satisfaction.
5. I am happy with the results of today’s meeting.

These items inquire about satisfaction-as-emotion, and so are consistent with YST’s definition of satisfaction as a valanced affective response. We did not use questions that asked about the effectiveness or efficiency of the work process or of the quality of the system or the work products, because such questions would elicit judgments rather than emotions, and so would not be useful measures of YST’s consequent construct. We also avoided ambiguous questions like, “I am satisfied with the outcomes,” because respondents it would not be clear whether the questions asked about an emotion or a judgment, so results would be uninterpretable.

2.2 Independent Variables

We developed two 4-item, seven-point semantic anchor scales to measure the two components of a yield shift: shifts-in-utility (US) and shifts-in-likelihood (LS). For both scales, a rating of 1 was anchored with the phrase “much less,” and a rating of 7 was anchored with the phrase “much more.” The items in the Shift-in-Utility scale were:

1. I got (less/more) from the meeting than I had anticipated.
2. I benefited (less/more) from this meeting than I expected.
3. The meeting did (less/more) good for me than I thought it would.
4. I gained (less/more) from the meeting than I believed I would.

The items for the Shift-In-Likelihood scale were:

1. The meeting made it (less/more) likely that I would attain something I want.
2. Because of the meeting, I am (less/more) likely to succeed on something I care about.
3. I am (less/more) likely to attain my goals because of this meeting.
4. Due to this meeting I am (less/more) likely to get what I want.

Consistent with the propositions of YST, these items do not inquire about the magnitude of utility and likelihood perceptions (e.g. “I benefited (much/ little) from this meeting”; “I am (likely/ unlikely) to attain something I want”), but rather about changes-in-magnitude of utility and likelihood perceptions (e.g. “I am less/more likely to get something I want”). If the logic of YST holds, then measures of the magnitude of utility and likelihood perceptions would not be useful predictors of satisfaction responses.

2.3 Participants

Because YST posits that satisfaction responses relate to the private goals of individuals, we opted to explore the theory in the field among people who had an ongoing personal stake in their work processes and outcomes. The participants included 282 professional knowledge workers distributed among 24 naturally occurring groups. The average age of the participants was 40.8 years (s=12.9) and their average work experience was 19.2 years (s=12.6). The groups worked for business, government, and non-profit organizations. All groups participated in workshops to address real problems assigned to them in the normal course of their professional duties. The tasks of the group varied but all included organizational problem solving, such as strategic planning, policy development, organizational restructuring, curriculum development, systems analysis and event planning.

The 24 groups ranged in size from 4 to 28 with a mean group size 11.7 and a standard deviation of 6.9 members. The median group size was 9 members. All groups used the same group support system1, and all engaged a professional facilitator to design and conduct a technology-supported collaborative workshop on their behalf.

2.4 Procedures

We gained the cooperation of several professional facilitators who regularly use group support systems to conduct collaborative workshops on behalf of knowledge workers in the field. The facilitators agreed

---

1 All teams used GroupSystems software.
to administer the satisfaction instrument to participants at the end of their workshops. The professional facilitators designed and conducted the workshops according to their usual practices. At the end of each workshop they asked participants if they would voluntarily take two minutes to respond to the one-page instrument on behalf of university researchers. They told participants that the instruments were completely anonymous, and that participation was completely optional. All instruments were administered on paper. Facilitators collected response forms from the participants and forwarded them to the researchers. Of the 282 knowledge workers in the 24 groups, 265 responded to all 18 items comprising the independent variables. Participants who submitted incomplete responses were eliminated from the analysis.

3. Validating the Instrument

The items in this instrument had been previously validated in earlier studies. The SP and SO items were validated and used in [22-24]. The US items had been validated in [23] and the LS items had been validated in [22]. The entire set of items, however, had not been validated together in a published manuscript, and so are done here for the first time.

Table 2 shows the results of a principal components analysis with varimax rotation for the set of 18 items. The results suggest a four factor model in which items intended to measure the same construct load heavily together on a single factor indicating convergent validity. Further, items tend not to load heavily on other factors, which indicates divergent validity. The Cronbach’s alpha measure for each set of items ranged from 0.925 to 0.972 indicating strong interitem reliability. Given strong indicators for convergent and divergent validity, and strong interitem reliability, the validity of the instrument is show to be sufficient to support hypothesis testing.

For the purposes of hypothesis testing, the value representing each construct was the mean score of the items comprising the scale used to measure it.

4. Results

We tested H1 and H2 using multiple regression to model SO and SP each as functions of likelihood shifts (LS) and utility shifts (US).

The results for SP are presented in Table 3. The overall model was statistically significant at p<.001 and statistically significant main effects (p<.001) were observed for both LS and US. The two factors accounted for approximately 47.6 percent of variance in SO.

### Table 2. Principal Components Analysis and Cronbach’s α

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td>US1</td>
<td>0.274</td>
<td>0.338</td>
<td>0.268</td>
<td>0.774</td>
<td>0.954</td>
</tr>
<tr>
<td>US2</td>
<td>0.279</td>
<td>0.334</td>
<td>0.324</td>
<td>0.776</td>
<td></td>
</tr>
<tr>
<td>US3</td>
<td>0.276</td>
<td>0.327</td>
<td>0.282</td>
<td>0.788</td>
<td></td>
</tr>
<tr>
<td>US4</td>
<td>0.307</td>
<td>0.295</td>
<td>0.326</td>
<td>0.767</td>
<td></td>
</tr>
<tr>
<td>LS1</td>
<td>0.291</td>
<td>0.193</td>
<td>0.709</td>
<td>0.391</td>
<td>0.925</td>
</tr>
<tr>
<td>LS2</td>
<td>0.210</td>
<td>0.180</td>
<td>0.845</td>
<td>0.239</td>
<td></td>
</tr>
<tr>
<td>LS3</td>
<td>0.194</td>
<td>0.257</td>
<td>0.834</td>
<td>0.227</td>
<td></td>
</tr>
<tr>
<td>LS4</td>
<td>0.145</td>
<td>0.252</td>
<td>0.846</td>
<td>0.190</td>
<td></td>
</tr>
<tr>
<td>SP1</td>
<td>0.826</td>
<td>0.320</td>
<td>0.168</td>
<td>0.215</td>
<td>0.951</td>
</tr>
<tr>
<td>SP2</td>
<td>0.706</td>
<td>0.303</td>
<td>0.280</td>
<td>0.335</td>
<td></td>
</tr>
<tr>
<td>SP3</td>
<td>0.794</td>
<td>0.285</td>
<td>0.252</td>
<td>0.270</td>
<td></td>
</tr>
<tr>
<td>SP4</td>
<td>0.850</td>
<td>0.240</td>
<td>0.169</td>
<td>0.217</td>
<td></td>
</tr>
<tr>
<td>SP5</td>
<td>0.833</td>
<td>0.348</td>
<td>0.179</td>
<td>0.19</td>
<td></td>
</tr>
<tr>
<td>SO1</td>
<td>0.417</td>
<td>0.760</td>
<td>0.246</td>
<td>0.266</td>
<td></td>
</tr>
<tr>
<td>SO2</td>
<td>0.394</td>
<td>0.778</td>
<td>0.239</td>
<td>0.305</td>
<td></td>
</tr>
<tr>
<td>SO3</td>
<td>0.303</td>
<td>0.804</td>
<td>0.258</td>
<td>0.314</td>
<td></td>
</tr>
<tr>
<td>SO4</td>
<td>0.335</td>
<td>0.773</td>
<td>0.310</td>
<td>0.319</td>
<td></td>
</tr>
<tr>
<td>SO5</td>
<td>0.333</td>
<td>0.793</td>
<td>0.245</td>
<td>0.328</td>
<td></td>
</tr>
</tbody>
</table>

Notes: N=265. Principle components analysis used varimax rotation. Rotated Eigenvalues: 4.38, 4.13, 3.56, 3.50. Utility Shift (US) items are US1 to US4, Likelihood Shift (LS) items are LS1 to LS4, satisfaction with meeting process (SP) items are SP1 to SP5, and satisfaction with meeting outcome (SO) items are SO1 to SO5. Boldface indicates the heaviest factor loading for an item.

### Table 3. Multiple Regression Results for Satisfaction with Process

<table>
<thead>
<tr>
<th>Parameter Estimates</th>
<th>B</th>
<th>s.e.</th>
<th>Model fit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.97 ***</td>
<td>0.24</td>
<td>F(2,263)=119.03 ***</td>
</tr>
<tr>
<td>Utility-Shift</td>
<td>0.53 ***</td>
<td>0.06</td>
<td>R^2=0.476</td>
</tr>
<tr>
<td>Likelihood-Shift</td>
<td>0.21 ***</td>
<td>0.06</td>
<td>adjusted R^2=0.472</td>
</tr>
</tbody>
</table>

Notes: N=265, ***p<.001

We tested for the possibility of an interaction effect between LS and US, a relationship that would not be consistent with the logic of YST. Results were not
statistically significant and the interaction variable was subsequently dropped from the model.

The results for SO are presented in Table 4. The overall model was statistically significant at p<.001 and statistically significant main effects (p<.001) were observed for both LS and US. The two factors accounted for approximately 59.1 percent of variance in SO. We tested for the possibility of an interaction effect between LS and US, which would not be consistent with the logic of YST. Results were not statistically significant and the interaction variable was subsequently dropped from the model.

Thus, both H1 and H2 were supported for both objects of satisfaction. The effect size was greater for SO than for SP. In both models the utility-shift variable appears to play a greater role in determining satisfaction responses than does the likelihood-shift variable. That is, a one-point average increase in a participant’s response to the US items will generate a 0.53 increase in SP, and .64 increase in the estimated SO whereas a similar one point increase in a participant’s response to the LS items will generate a more modest increase of 0.21 in SP and 0.24 in LU. Thus, while the regression results supported the hypotheses, they also reveal potential differences in the strength of the relationships between the independent variables and dependent variables.

5. Discussion

Under the conditions of this study, the observed relationships between yield shifts and satisfaction responses were consistent with the theoretical relationships proposed by the Yield Shift Theory of Satisfaction; the magnitude and direction of satisfaction responses were consistent with the predictions of theory. The more positive were the reported yield shifts, the more positive the satisfaction responses tended to be. Likewise, the more negative were the yield shift they reported, the more negative the satisfaction responses tended to be. The predicted relationships held for both independent variables – likelihood shifts and utility shifts. They also held for two different objects-of-satisfaction: work process and work outcomes. Thus, the study provides empirical support for the theory.

If subsequent studies add support the theory, then YST may become a useful tool for the designers and managers of information systems. YST suggests that designers could probe the dissatisfaction responses of stakeholders toward existing systems and proposed system requirements. If the goals underlying those responses can be routinely surfaced, then designers can make design choices to support those goals, and so increase the value the system creates for stakeholders.

Managers of information systems may also find YST useful, for example, in planning the roll-out IS innovations in ways that produce positive satisfaction responses, and so increase the likelihood of adoption and diffusion. Roll-out planning could begin early in the project with stakeholder analysis to learn the stakeholders current goals, and, if necessary, to get them focused on other, higher-yield goals that the system might serve.

It is intriguing to note that, under the conditions of this study, for both objects-of-satisfaction, the measures of Utility Shift were stronger predictors of reported satisfaction than were measures Likelihood Shifts. It is also interesting to note that the strengths of associations between independent and dependent variables varied from object- to object-of-satisfaction. It would be useful to conduct further studies under other conditions, with other dependent and independent variables, among different populations and with other objects-of-satisfaction to discover how consistent these patterns may be, and perhaps to fuel further development of the theory.

This study has several limitations that could also be addressed with further research. The study gathered data from people in a single culture – the United States. If the logic of YST is sound, then the relationships it posits should hold across cultures. Additional research is warranted, therefore, to gather similar data to test the theory in other cultures. This study also measured, rather than manipulating the causal construct. It verifies predicted associations among constructs, but its design is not sufficient to assert causal direction. It

| Table 4. Multiple Regression Results for Satisfaction with Outcome |
|------------------|-----|---|----------------|
| Parameter Estimates: | B  | s.e. | Model fit |
| Intercept | 0.86*** | 0.22 | $F(2, 262)=189.28^{***}$ |
| Utility-Shift | 0.64*** | 0.06 | $R^2=0.591$ |
| Likelihood-Shift | 0.24*** | 0.06 | adjusted $R^2=0.588$ |

Notes: N=265, ***p<.001
would therefore be useful to follow up with experimental studies to test the theory's propositions.

Finally, the term, “satisfaction,” labels an affective arousal toward some object. The physiological indicators of affective arousal, however, are indistinguishable regardless of label – fear, joy, anger, or relief all manifest with, for example, increased heart rate, respiration, pupil dilation, and galvanic skin responses. Additional research may be warranted to explore whether the causal mechanisms proposed here to explain satisfaction responses could be generalized to a theory of affective responses.

6. Conclusions

This study provides empirical support for the Yield Shift Theory of Satisfaction, but more empirical research will be required under a variety of conditions to validate its scientific utility.

7. References


