AN ACADEMIC GREEN COMPUTING INITIATIVE

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ABSTRACT

This paper describes a recent green computing initiative at an academic institution, during which the computer printer paper consumption was drastically reduced by over 50%, but students were inconvenienced through the loss of unlimited free printing. The results of a survey of students suggest that institutional pessimism and institutional dispositional attribution are predictors of poor attitudes toward this green computing initiative, while environmental dedication appears to strongly influence positive attitude toward this green computing initiative.

Keywords: Green computing, paperless, paper reduction, end-user computing

INTRODUCTION

In today's volatile world economy, it makes sense for both ecological and economic reasons for any organization to try and reduce the amount of energy and other resources it consumes through the utilization of technology. The pursuit of this goal is referred to as green computing, which is the study and practice of using computer resources efficiently (Shaik 2012). Promoting and implementing green computing initiatives can sometimes be inconvenient, due to limitations or cost increases on both the implementer and the individual participants of the initiatives.

This paper describes a recent green computing initiative at an academic institution, during which the computer printer paper consumption was drastically reduced. The details and motivation behind the initiative are described, as well as the results. Additionally, a sample of student computer users was surveyed regarding their attitude toward the initiative and their opinions on several potential predictors of their attitude. An exploratory analysis was conducted and the results are shared.

GREEN COMPUTING INITIATIVE

A small eastern university located in the United States had a policy of providing its students free use of computer printers with unlimited paper use whenever they wanted it. The university routinely found itself burning through over a million sheets of paper per semester between student and staff use. The paper usage culminated in an estimated use of 1,584,000 total sheets during the fall semester of 2010. A green computing initiative was suggested, investigated, and implemented over the summer of 2011, which involved replacing the free printers with print

kiosks provided by a vendor. These kiosks were part of a pay-to-print model that charged 9 cents per black and white page printed, and 49 cents per color page printed. Payment could be made using debit or credit cards, or the student's university ID card right at the kiosk. Students were given a monetary credit toward printing for each of the first two semesters after the implementation to help ease the transition. Additionally, faculty and staff were requested to refrain from using paper or requiring paper submissions from students when digital means was available. The campus already had a strong computing culture, with all incoming students receiving a laptop, and extensive wireless coverage in all campus buildings. The initiative was implemented on time and with very little complication. The results of the initiative were that paper usage in the fall of 2011 was reduced by more than 50% from the previous year, as approximately 603,500 sheets were used.

RESEARCH PROBLEM

The students involved in this initiative did not have the ability to "opt out" of the program. Once the academic cabinets approved the measure, students were forced to comply with it by virtue of their other option being removed. Students who lived on campus still had the ability to obtain their own printers and operate them in their dorm rooms, but apart from that the options were to pay for printing or not print. It was considered very likely that some students would be unhappy with the change, even with the printing credits, since the initiative was enacted outside of their control, and since successful implementation would remove a benefit they used to enjoy.

The authors of this paper attempted to measure the attitude of students toward the green computing initiative, and to investigate several antecedents of attitude suggested by literature in order to determine if they were predictors of attitude toward the initiative. Specifically, the potential predictors of organizational cynicism and environmental dedication were included in the survey as antecedents of attitude toward the initiative.

RELEVANT LITERATURE

While the term 'green computing' has seen increased use in the last few years, the concepts and approach have been around for decades. Beginning with energy efficient lighting and reduced-energy computer monitors in the early 1990s, initiatives and promotions to reduce energy consumption in all appliances gained traction over the last twenty years (Harmon & Auseklis 2009). Today, an increased awareness of carbon emissions and worries about possible climate change, coupled with rising data center power consumption costs make green computing an important topic for all technology enabled organizations (Harmon & Auseklis 2009).

For this study, there was no obvious measure of success available for the initiative, since students would be forced to comply with the implementation no matter what. We settled on a

measurement of the respondents' attitude toward the initiative as an indication of whether they were happy with it or not. Attitude has been shown in many studies to be a predictor of behavior. Furthermore, literature suggests a positive attitude toward the environment leads to environmentally favorable behavior (Bodderas 2010). Attitude toward the green computing initiative therefore became our dependent variable. We adapted an attitude measure previously used in a version of the Technology Acceptance Model (Malhotra & Galletta 1999).

We also examined the literature and theories behind organizational change, since the green computing initiative was very similar to a change that might have occurred in the workplace, and which must now be dealt with by the organizational members. At a high level, literature supports the idea that positive attitudes by employees enable positive change in the organization (Avey, Wernsing, & Luthans 2008; Fugate & Kinicki 2008). Conversely, negative attitudes toward an organization are likely to influence the attitude toward change in a negative way (Wanous, Reichers, & Austin 2000). Organizational cynicism is a tested set of constructs used to measure the degree of pessimism about change efforts being successful, as well as the degree of dispositional attribution, or whether people responsible should be blamed for the failure of organizational change (Wanous et al. 2000). We used these measurements to ascertain the respondents' level of cynicism about the academic institution, in the form of pessimism toward the university's ability to affect change, and dispositional attribution (blame of university representatives) for the failure of change.

We also felt that it was important to determine the general attitude of respondents toward environmental initiatives. Because the nature of this particular green computing initiative is such that it is likely to inconvenience some of those who are affected by it, we specifically wanted a scale that measured whether people had a positive disposition toward environmental policies even if they were inconvenienced by them. We were unable to find such a scale, so we developed our own. We called it environmental dedication. It consists of four items essentially attempting to ascertain whether people are in favor of environmental policies even if they are inconvenienced by them.

HYPOTHESIS & METHOD

We propose that, among respondents, the greater the level of institutional pessimism, the poorer the attitude toward the initiative (H1).

We also propose that the greater the level of institutional dispositional attribution, the poorer the attitude toward the initiative (H2).

Finally, we propose the greater the level of environmental dedication, the more positive the attitude toward the initiative (H3).

The research design is a field study. A survey instrument served as the method of data collection. The survey was administered among several business classes in a school of business that

contained both graduate and undergraduate students. The survey was given during class time as a non-mandatory activity. It was handed out in hardcopy form and retrieved by an attendant when each subject was finished. The courses selected for the survey provided a sampling frame of approximately 154 students, out of which 126 total surveys were returned. (approximately 82 percent). Three surveys were deemed incomplete or unusable, leaving the number of total valid surveys at 123. The measurement scale was a 7-point Likert scale for all construct measurement items. The data was hand-coded into an electronic spreadsheet for storage and eventual analysis. Exploratory factor analysis was used to assess the constructs. Exploratory factor analysis for all constructs showed all items loading at acceptable values (over 0.7) with the following exceptions: A few items from the institutional pessimism and dispositional attribution loaded lower (but still over .555), and there were some minor crossloadings between these two constructs (two in the low .400s, nothing else over .400), but since they were part of established scales, and since they are part of the same overall construct (and thus very similar measures), they were not dropped from the model. Cronbach's alpha for institutional pessimism was 0.826; for dispositional attribution was 0.888; for environmental dedication was 0.919; for attitude toward the initiative was 0.944.

RESULTS

H1, which stated the greater the level of institutional pessimism, the poorer the attitude toward the initiative, was supported. The results are shown in Table 1. The coefficient was negative, indicating an inverse relationship as predicted.

TABLE 1

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	28.56322365	28.56322365	13.45644781	0.000364236
Residual	121	256.8397032	2.122642175		
Total	122	285.4029268			
R Square	0.100080346				

H2, which stated the greater the level of institutional dispositional attribution, the poorer the attitude toward the initiative, was supported. The results are shown in Table 2. The coefficient was negative, indicating an inverse relationship as predicted.

TABLE 2

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	23.47875	23.47875	10.84638	0.001298297
Residual	121	261.9242	2.164663		
Total	122	285.4029			
R Square	0.082265257				

H3, which stated the greater the level of environmental dedication, the more positive the attitude toward the initiative, was supported. The results are shown in Table 3.

TABLE 3

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	86.27038033	86.27038	52.42094	4.51E-11
Residual	121	199.1325465	1.645724		
Total	122	285.4029268			
R Square	0.302275738				

DISCUSSION OF RESULTS

The results suggest that institutional pessimism and institutional dispositional attribution are predictors of poor attitudes toward a green computing initiative that has the potential to inconvenience students, while environmental dedication appears to be a strong predictor of positive attitude toward a green computing initiative that has the potential to inconvenience some students. The reported R square values were low for the negative influences, but solid for the positive influence.

FUTURE RESEARCH

This study illustrates some of the predictors of positive attitude toward a green computing initiative that is inconvenient to some participants, but certainly more are available. We suggest the use of established environmental attitude scales, since there are many available and they may provide an interesting additional set of predictors to compare which measures explain more variation. An interesting side note is that several respondents wrote in the margins of the survey their disappointment that a paper survey was being given (which was not by design, but because

it best fit the nature and timing of the survey administration) instead of an electronic one. It would be interesting to gauge the respondents' attitude toward taking the paper survey in future studies of this nature. Finally, with the potential for both negative and positive influences on the same respondent (i.e., they are cynical about the institution AND they are positive toward environmental policies), which is the stronger influence as measured by their attitude toward the initiative? The data necessary to analyze this aspect was captured in this study and will be examined at a later date.

LIMITATIONS

The sample was only from students taking business classes, and therefore not an accurate representation of the student body as a whole. Also, some student educational programs are likely to require more printing than others, and therefore those students are likely to be more affected by the initiative than others. That factor is not accounted for in the study.

CONCLUSION

This study is the first of several analyses of a robust data set. The results of this study suggest that students already cynical about the academic institution's ability to orchestrate change will have a poor attitude toward a green computing change that has the potential to inconvenience some of them. The results also suggest that students who are positive toward environmental policies even when they are inconvenienced by them will be positive toward a green computing change that has the potential to inconvenience them. It is important to note, while assessing these results, that not all students were inconvenienced by the print initiative. Many classes that used to require printing do not anymore, and many students that do still need to print may consider it just as convenient to their routine to print at home. Some even prefer to transfer documents electronically at no charge rather than print them. Future studies using this data will expand on these factors.

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