ISSN: 1975-8480
Volume 2 · Number 2 · Winter 2007

Management Review:
An International Journal

KINFORMS

Management Review: An International Journal
Volume 2, Number 2, December 30, 2007
ISSN: 1975-8480

Sang Hyung Ahn
Editor-In-Chief
Seoul National University

www.kinforms.org
Email: kinforms@kinforms.org

Table of Contents

Management Review: An International Journal Volume 2 Number 2 Winter 2007

An Extended Model of Adoption of Technology in Households: A Model Test on People's Intention to Adopt a Mobile Phone

Gérard Fillion
Faculty of Administration
University of Moncton
Moncton, New Brunswick, Canada
E-mail: gerard.fillion@umoncton.ca

Sylvie Berthelot
Faculty of Administration
University of Moncton
Moncton, New Brunswick, Canada
E-mail: sylvie.berthelot@umoncton.ca

ABSTRACT

Individual adoption of technology has been studied extensively in the workplace (Brown & Venkatesh, 2005). Far less attention has been paid to adoption of technology in the household (Brown & Venkatesh, 2005). Obviously, mobile phone is now integrated into our daily life. Indeed, according to the more recent forecast of Gartner Research, 986 millions of mobile phones have been sold throughout the world in 2006 (Ouellet, 2006). And, as the tendency is showing up, mobile phone use will be continuously increasing in the future. The purpose of this study is then to investigate who has the intention to adopt a mobile phone,

and why? In other words, we try to identify who really wants to buy a mobile phone and what are the determining factors who will make such that he/she will buy it? On the basis of the theoretical foundations developed by Brown and Venkatesh (2005) to verify the determining factors in intention to adopt a computer in household by American people, this study examines the determining factors in intention to buy a mobile phone in household by Canadian people. Data were gathered from 307 Atlantic Canadian people who do not yet own a mobile phone. Data analysis was performed using the structural equation modeling software Partial Least Squares (PLS). The results revealed that only one third of the variables examined in the study showed to be determining factors in intention to buy a mobile phone for household use.

INTRODUCTION

Since numerous years, mobile phone is used for different professional purposes, particularly by senior managers in the workplace. And this technology is more and more used in the workplace since mobile applications have been integrated to actual enterprise business strategies. Individual adoption of technology has been studied extensively in the workplace (Brown & Venkatesh, 2005). Far less attention has been paid to adoption of technology in the household (Brown & Venkatesh, 2005). Obviously, mobile phone is now integrated into our daily life. According to the more recent forecast of Gartner Research, 986 millions of mobile phones have been sold throughout the world in 2006 (Ouellet, 2006). And, as the tendency is showing up, mobile phone use will be continuously increasing in the future. The purpose of this study is then to investigate who has the intention to adopt a mobile phone, and why? In other words, we try to identify who

really wants to buy a mobile phone and what are the determining factors who will make such that he/she will buy it?

Few studies have been conducted until now which investigate the intention to adopt a mobile phone by people in household (in the case of those who do not yet own a mobile phone) or the use of mobile phone in the daily life of people in household (in the case of those who own a mobile phone). Yet, we can easily see that mobile phone is actually completely transforming the ways of communication of people around the world. It is therefore crucial to more deeply examine the determining factors in intention to buy a mobile phone by people in household. This is the aim of the present study. The related literature on the actual research area of mobile phone is summarized in Table 1.

In addition to the summary of literature on the actual research area of mobile phone presented in Table 1, other researchers have identified some factors which might increase the intention to adopt a mobile phone by people in household. For example, in a large study carried out in 43 countries of the world, Kauffman and Techatassanasoontorn (2005) noted a faster increase in the mobile phone usage in countries having a more developed telecommunications infrastructure, being more competitive on the wireless market, and having lower wireless network access costs and less standards regarding the wireless technology. And a study involving 208 users by Wei (in press) showed that different motivations predict diverse uses of mobile phone. According to the Wei's findings, mobile phone establishes a bridge between interpersonal communication and mass communication.

Table 1
Related Literature Survey
(adapted from Isiklar & Büyüközhan, 2007, p. 267)

Research Area	*References*
Mobile phone diffusion and its impacts on people's daily life.	LaRose (1989) Kwon & Chidambaram (2000) Botelho & Costa Pinto (2004) Funk (2005) Andonova (2006)
Mobile phone ownership and usage.	LaRose (1989) Kwon & Chidambaram (2000) Palen et al. (2000) Aoki & Downes (2003) Selwyn (2003) Davie et al. (2004)
Mobile phone ownership and usage from a behavioral and psychological perspective.	Karjaluoto et al. (2003) Wilska (2003) Davie et al. (2004)
Effects on human health and daily activities.	Repacholi (2001) Salvucci & Macuga (2002) Weinberger & Richter (2002) Sullman & Baas (2004) Treffner & Barrett (2004) Westerman & Hocking (2004) Balik et al. (2005) Balikci et al. (2005) Eby et al. (2006) Rosenbloom (2006) Törnros & Bolling (2006)
Evaluation and design of mobile phone features for user interface and user satisfaction.	Chuang et al. (2001) Chen et al. (2003) Han & Wong (2003) Chae & Kim (2004) Han et al. (2004) Lee et al. (2006)
Analytical evaluations of mobile phone-related observations.	Tam & Tummala (2001) Campbell & Russo (2003) Han & Wong (2003) Wang & Sung (2003) Lai et al. (2006)

As we can see in the summary of literature related to mobile phone presented above, few studies until now examined the determining factors in intention to adopt a mobile phone by people in household. Thus, the present study brings an important contribution to fill this gap as it allows a better understanding of the impacts of mobile phone use in people's daily life. It focuses on the following two research questions: (1) Who are the potential buyers of a mobile phone for household use? and (2) What are the determining factors in intention to buy a mobile phone for household use?

The paper builds on a framework suggested by Fillion (2004) in the conduct of hypothetico-deductive scientific research in organizational sciences, and it is structured as follows: first, the theoretical approach which guides the study is developed; second, the methodology followed to conduct the study is described; and finally, the results of the study are reported and discussed.

THEORETICAL APPROACH

This study is based on the theoretical foundations developed by Venkatesh and Brown (2001) to investigate the factors driving personal computer adoption in American homes as well as those developed by Brown and Venkatesh (2005) to verify the determining factors in intention to adopt a personal computer in household by American people. In fact, Brown and Venkatesh (2005) performed the first quantitative test of the recently developed model of adoption of technology in households (MATH) and they proposed and tested a theoretical extension of MATH integrating some demographic characteristics varying across different life cycle stages (see Danko & Schaninger, 1990) as moderating variables. With the exception of marital status (we included sex instead), all the variables proposed and

tested by Brown and Venkatesh (2005) are used in this study, but none of them is tested as moderating variable. And we also added two new variables in order to verify whether people are thinking that mobile phone might be used for security and mobility. The resulting theoretical research model is depicted in Figure 1.

Figure 1 shows that Brown and Venkatesh (2005) integrated MATH and Household Life Cycle in the following way. MATH presents five attitudinal beliefs grouped into three sets of outcomes: *utilitarian*, *hedonic*, and *social*. Utilitarian beliefs are most consistent with those found in the workplace and can be divided into beliefs related to *personal use*, *children*, and *work* (we added beliefs related to *security* and *mobility*). The extension of MATH suggested and tested by Brown and Venkatesh (2005) presents three normative beliefs: *influence of friends and family*, *secondary sources*, and *workplace referents*. As for control beliefs, they are represented in MATH by five factors: *fear of technological advances*, *declining cost*, *cost*, *perceived ease of use*, and *self-efficacy* (or *requisite knowledge*). And, according to Brown and Venkatesh (2005), integrating MATH with a life cycle view (*marital status* (we included *sex* instead of *marital status*), *age*, and *presence/age of children*) that includes *income* (see Wagner & Hanna, 1983) allows to provide a richer explanation of household personal computer adoption (household mobile phone adoption in this study) than those provided by MATH alone. Finally, as shown in Figure 1, the dependant variable of the research model developed is related to *behavioral intention* (the intention to adopt (or buy) a mobile phone by people in household). All of the variables integrated in the theoretical research model depicted in Figure 1 are defined in Table 2.

Figure 1
Theoretical Research Model

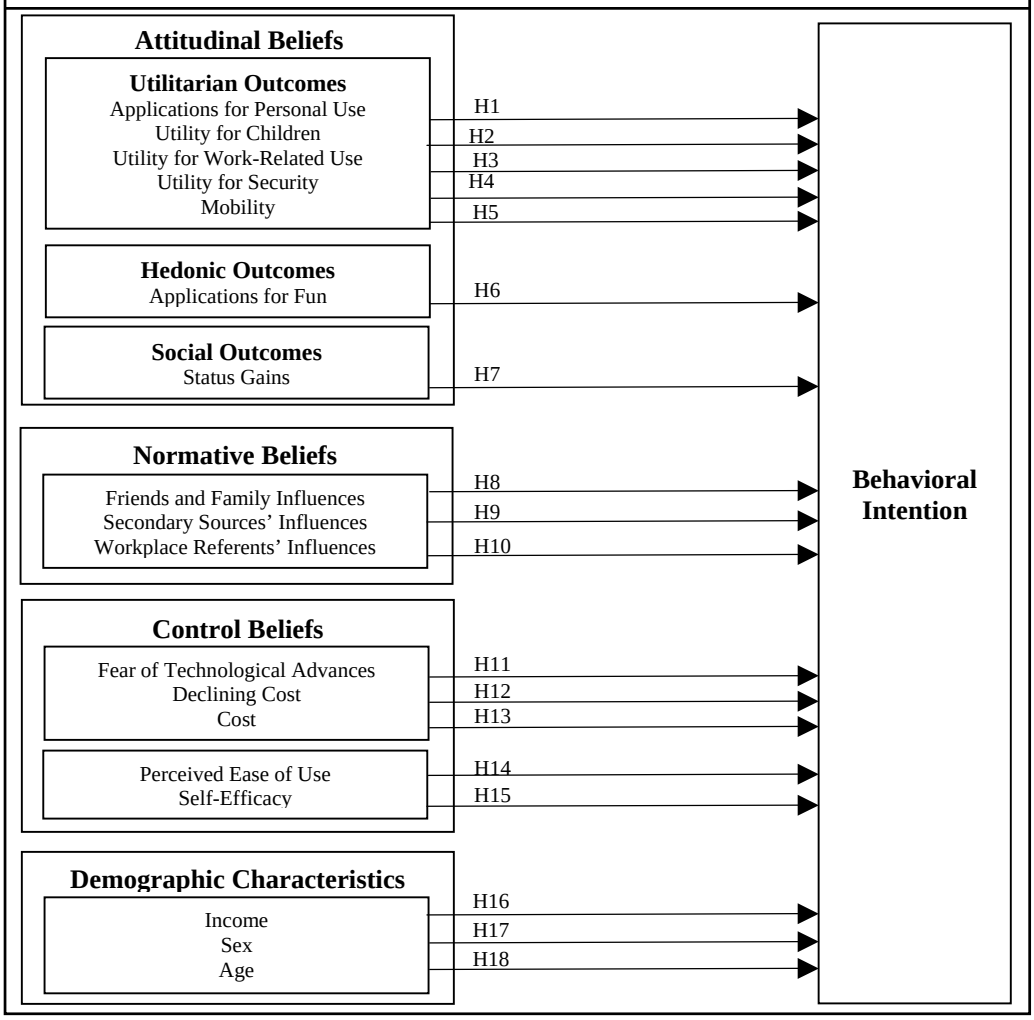


Table 2
Variables and Definitions

Beliefs and Characteristics	***Variables***	***Definitions***
Attitudinal Beliefs	Applications for Personal Use	The extent to which using a mobile phone enhances the effectiveness of household activities (adapted from Venkatesh & Brown, 2001).
	Utility for Children	The extent to which using a mobile phone enhances the children's effectiveness in their activities (adapted from Venkatesh & Brown, 2001).
	Utility for Work-Related Use	The extent to which using a mobile phone enhances the effectiveness of performing work-related activities (adapted from Venkatesh & Brown, 2001).
	Utility for Security	The extent to which using a mobile phone increases the security of its user and his/her family.
	Mobility	The extent to which a mobile phone allows to use only this telephone to perform all personal and professional activities.
	Applications for Fun	The pleasure derived from mobile phone use (adapted from Venkatesh & Brown, 2001). These are specific to mobile phone usage, rather than general traits (adapted from Brown & Venkatesh, 2005; see Webster & Martocchio, 1992, 1993).
	Status Gains	The increase in prestige that coincides with the purchase of a mobile phone for home use (adapted from Venkatesh & Brown, 2001).
Normative Beliefs	Friends and Family Influences	"The extent to which the members of a social network influence one another's behavior" (Venkatesh & Brown, 2001, p. 82). In this case, the members are friends and family (Brown & Venkatesh, 2005).
	Secondary Sources' Influences	The extent to which information from TV, newspaper, and other secondary sources influences behavior (Venkatesh & Brown, 2001).
	Workplace Referents' Influences	The extent to which coworkers influence behavior (Brown & Venkatesh, 2005; see Taylor & Todd, 1995).
Control Beliefs	Fear of Technological Advances	The extent to which rapidly changing technology is associated with fear of obsolescence or apprehension regarding a mobile phone purchase (adapted from Venkatesh & Brown, 2001).
	Declining Cost	The extent to which the cost of a mobile phone is decreasing in such a way that it inhibits adoption (adapted from Venkatesh & Brown, 2001).
	Cost	The extent to which the current cost of a mobile phone is too high (adapted from Venkatesh & Brown, 2001).
	Perceived Ease of Use	The degree to which using the mobile phone is free from effort (Davis, 1989; also adapted from Venkatesh & Brown, 2001).
	Self-Efficacy (or Requisite owledge)	The individual's belief that he/she has the knowledge necessary to use a mobile phone. This is closely tied to computer self-efficacy (Compeau & Higgins, 1995a, 1995b; see also Venkatesh & Brown, 2001).
Demographic Characteristics	Income	The individual's year gross income (see Wagner & Hanna, 1983).
	Sex	The individual's sex (male or female) (see Danko & Schaninger, 1990).
	Age	The individual's age (see Danko & Schaninger, 1990). In this case, age is calculated from the individual's birth date.

We can see in Table 2 that the definitions of MATH variables integrated in the theoretical research model proposed in Figure 1 are, in the whole, adapted from the theoretical foundations developed by Venkatesh and Brown (2001) to investigate the factors driving personal computer adoption in American homes. As for the definitions of the variables related to the household life cycle view and income, they were taken from Danko and Schaninger (1990) as well as Wagner and Hanna (1983), respectively. And the definitions of the two new variables that we added to the model are from our own. In fact, we defined these variables in accordance with which we wanted to measure regarding security and mobility before to develop and validate items measuring them on the basis of the definitions formulated.

In the reminder of the section, we develop eighteen research hypotheses (H1-H18) for the model suggested in Figure 1, which integrates MATH beliefs with some household life cycle variables (income, sex, and age) and our two new variables related to security and mobility.

H1: *Applications for personal use increase the intention to buy a mobile phone for household use.*

H2: *Utility for children increases the intention to buy a mobile phone for household use.*

H3: *Utility for work increases the intention to buy a mobile phone for household use.*

H4: *Utility for security increases the intention to buy a mobile phone for household use.*

H5: *Mobility increases the intention to buy a mobile phone for household use.*

H6: *Applications for fun increase the intention to buy a mobile phone for household use.*

H7: *Status gains increase the intention to buy a mobile phone for household use.*

H8: *Friends and family influences increase the intention to buy a mobile phone for household use.*

H9: *Secondary sources' influences increase the intention to buy a mobile phone for household use.*

H10: *Workplace referents' influences increase the intention to buy a mobile phone for household use.*

H11: *Fear of technological advances decreases the intention to buy a mobile phone for household use.*

H12: *Declining cost increases the intention to buy a mobile phone for household use.*

H13: *Cost decreases the intention to buy a mobile phone for household use.*

H14: *Perceived ease of use increases the intention to buy a mobile phone for household use.*

H15: *Self-efficacy increases the intention to buy a mobile phone for household use.*

H16: *Income decreases the intention to buy a mobile phone for household use.*

H17: *Sex (male vs. female) increases the intention to buy a mobile phone for household use.*

H18: *Age decreases the intention to buy a mobile phone for household use.*

In the next section of the paper, we describe the methodology followed to conduct the study.

METHODOLOGY

The study was designed to gather information concerning mobile phone adoption decisions in Atlantic Canadian households. The focus of the study is on individuals who do not yet own a mobile phone. We conducted a telephone survey research among individuals of a large area in Atlantic Canada. In this section, we describe the instrument development and validation, the sample and data collection, as well as the data analysis process.

Instrument Development and Validation

To conduct the study, we used the survey instrument developed and validated by Brown and Venkatesh (2005) to which we added two new scales measuring some other dimensions in intention to buy a mobile phone by people in household, that is, utility for security and mobility. The survey instrument was then translated in French (a large part of the population in Atlantic Canada is speaking French) and both the French and English versions were evaluated by peers. This review assessed face and content validity (see Straub, 1989). As a result, changes were made to reword items and, in some cases, to drop items that were possibly ambiguous, consistent with Moore and Benbasat's (1991) and DeVellis's (2003) recommendations for scale development. Subsequent to this, we distributed the instrument to a group of 25 MBA students for evaluation. Once again, minor wording changes were

made. Finally, we performed some adjustments to the format and appearance of the survey instrument, as suggested by both peers and MBA students, though these minor changes had not a great importance here given the survey was administered using the telephone. As the instrument was already validated by Brown and Venkatesh (2005) and showed to be of a great reliability, and that we added only few items to measure two new variables, then we have not performed a pilot-test with a small sample. The evaluations by both peers and MBA students were giving us some confidence that we could proceed with a large-scale data collection. The specific measures are presented in Appendix A.

Sample and Data Collection

First, in this study, we chose to survey people in household over 18 years taken from a large area in Atlantic Canada who do not yet own a mobile phone. To do that, undergraduate and graduate students studying at our faculty were hired to collect data using the telephone. A telephone was then installed in an office of the faculty, and students, one at a time over a 3 to 4-hour period, were asking people over the telephone to answer our survey. And in order to get a diversified sample (e.g., students, retired people, people not working, people working at home, and people working in enterprises), data were collected from 9 a.m. to 9 p.m. Monday through Friday over a 5-week period. Using the telephone directory of the large area in Atlantic Canada chosen for the study, students were randomly selecting people and asking them over the telephone to answer our survey. The sample in the present study is therefore a randomized sample, which is largely valued in the scientific world given the high level of generalization of the results got from such a sample. Once an individual had the necessary characteristics to answer the survey and was accepting to answer it, the student was there to guide him/her to rate each item of

the survey on a seven points Likert-type scale (1: strongly disagree … 7: strongly agree). In addition, the respondent was asked to answer some demographic questions. Finally, to further increase the response rate of the study, each respondent completing the survey had the possibility to win one of the 30 Tim Hortons $10 gift certificates which were drawn at the end of the data collection. To that end, the phone number of each respondent was put in a box for the drawing. Following this process, 307 people in household answered our survey over a 5-week period.

Data Analysis Process

The data analysis of the study was performed using a structural equation modeling software, that is, Partial Least Squares (PLS-Graph 3.0). Using PLS, data have no need to follow a normal distribution and it can easily deal with small samples. In addition, PLS is appropriate when the objective is a causal predictive test instead of the test of a whole theory (Barclay et al., 1995; Chin, 1998) as it is the case in this study. To ensure the stability of the model developed to test the research hypotheses, we used the PLS bootstrap resampling procedure (the interested reader is referred to a more detailed exposition of bootstrapping (see Chin, 1998; Efron & Tibshirani, 1993)) with an iteration of 100 sub-sample extracted from the initial sample (307 Atlantic Canadian people). Some analyses were also performed using the Statistical Package for the Social Sciences software (SPSS 13.5). The results follow.

RESULTS

In this section of the paper, the results of the study are reported. We begin to present some characteristics of the participants. Then we

validate the PLS model developed to test the research hypotheses. Finally, we describe the results got from PLS analysis to test the research hypotheses.

Participants

The participants in this study were either relatively aged or relatively young, with a mean of 44.7 years and a very large standard deviation of 18.2 years. These statistics on the age of the participants are, in fact, consistent with the growing old population phenomenon. More than half of the participants were female (57%). Near from 80% of the participants were married (43.8%) or single (34%). The gross yearly income of the respondents in the study was in the range of $0 to $40,000, which is relatively low according to the relatively high life cost that we have to face actually. Indeed, 70.6% of the respondents were winning between $0 and $40,000, and, from this percentage, only 18.9% were winning between $30,000 and $40,000. Only 1.1% of the respondents were winning $100,000 or over. Regarding the level of education, 28.8% of the participants in the study got a high-school diploma, 30.4% got a college degree, and 24.5% completed a baccalaureate. Only 1.6% of the participants got a doctorate, which is consistent with the whole population in general. Finally, the respondents in our study were mainly full-time employees (38.9%), retired people (20.6%), self employed (11.8%), part-time employees (11.4%), and students (7.2%). These last statistics on the respondents' occupation help to explain the very large standard deviation on their age reported above. Indeed, 7.2% of the respondents were young students, while 20.6% were retired people. So the difference in age between the two groups is very large.

Validation of the PLS Model to Test Hypotheses

First, to ensure the reliability of a construct or a variable using PLS, one must verify the three following properties: individual item reliability, internal consistency, and discriminant validity (Yoo & Alavi, 2001; see the paper for more details).

To verify individual item reliability, a confirmatory factor analysis (CFA) was performed on independent and dependent variables of the theoretical research model. A single iteration of the CFA was necessary given all loadings of the variables were superior to 0.50 and then none item was withdrawn nor transferred in another variable in which the loading would have been higher. Indeed, in the whole, items had high loadings, which suppose a high level of internal consistency of their corresponding variables. In addition, loadings of each variable were superior to cross-loadings with other variables of the model. Hence the first criterion of discriminant validity was satisfied.

And to get composite reliability indexes and average variance extracted (AVE) in order to satisfy the second criterion of discriminant validity and to verify internal consistency of the variables, we used PLS bootstrap resampling procedure with an iteration of 100 sub-sample extracted from the initial sample (307 Atlantic Canadian people). The results are presented in Table 3.

As shown in Table 3, PLS analysis indicates that all square roots of AVE (boldfaced elements on the diagonal of the correlation matrix) are higher than the correlations with other variables of the model. In other words, each variable shares more variance with its measures than it shares with other variables of the model. Consequently, discriminant validity is verified. Finally, as supposed previously, we can see in Table 3 that PLS analysis showed high composite reliability indexes for all

variables of the theoretical research model. The variables have therefore a high internal consistency, with composite reliability indexes ranging from 0.86 to 0.98.

Hypothesis Testing

To test the research hypotheses, we developed a PLS model similar to those of Fillion (2005), Limayem and DeSanctis (2000), Limayem et al. (2002), and Yoo and Alavi (2001). The PLS model is depicted in Figure 2.

As we can see in Figure 2, the high t-value (5.75) and beta coefficient (0.30) got in the PLS structural equation model indicate that the path from applications for personal use to behavioral intention is very significant ($p < 0.001$). In short, as we expected, in this study, applications for personal use increased the intention to buy a mobile phone for household use. As a result, hypothesis 1 is supported. Figure 2 shows that the path from mobility to behavioral intention is significant ($t = 2.73$, beta = 0.15, $p < 0.005$). In other words, as we anticipated, the new variable mobility that we added in this study to the model suggested by Brown and Venkatesh (2005) increased the intention to buy a mobile phone for household use. Thus, hypothesis 5 is supported. The high t-value (3.22) and beta coefficient (0.18) got in the PLS structural equation model presented in Figure 2 indicate that the path from friends and family influences to behavioral intention is very significant ($p < 0.001$). Therefore, as we expected, in this study, friends and family influences increased the intention to buy a mobile phone for household use. As a result, hypothesis 8 is supported.

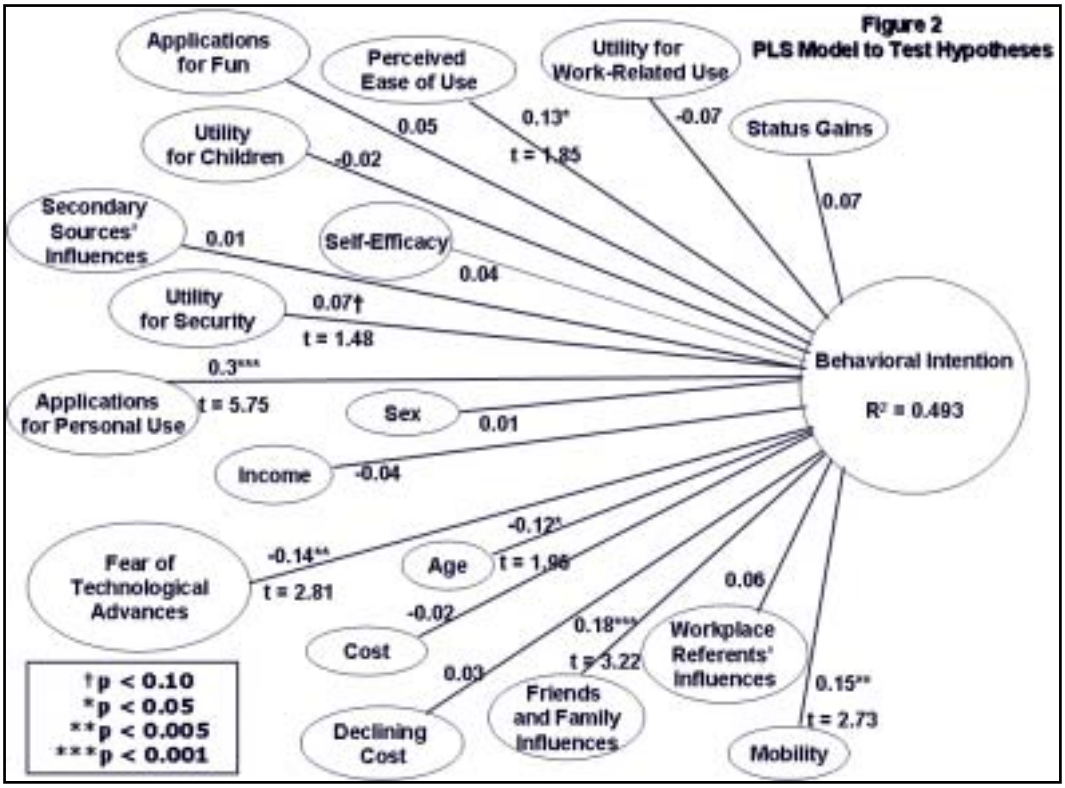
Table 3
Means, Standard Deviations, Composite Reliability Indexes, Correlations, and Average Variance Extracted of Variables

Variable	*M*	*SD*	*Relia-bility Index*	*Correlations and Average Variance Extracted*[c]																		
				1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*
1. Applications for Personal Use	3.52	2.04	**0.92**	**0.89**																		
2. Utility for Children	3.50	2.19	**0.96**	.46	**0.94**																	
3. Utility for Work-Related Use	3.28	2.24	**0.95**	.46	.26	**0.92**																
4. Utility for Security	5.58	1.89	**0.91**	.28	.28	.25	**0.88**															
5. Mobility	3.40	2.19	**0.92**	.31	.16	.38	.13	**0.89**														
6. Applications for Fun	3.20	2.07	**0.93**	.48	.25	.45	.24	.40	**0.88**													
7. Status Gains	2.43	1.82	**0.91**	.27	.25	.33	.16	.33	.40	**0.88**												
8. Friends and Family Influences	3.55	2.10	**0.94**	.29	.22	.36	.23	.26	.38	.31	**0.89**											
9. Secondary Sources' Influences	3.95	2.21	**0.92**	.16	.17	.26	.12	.19	.24	.21	.34	**0.90**										
10. Workplace Referents' Influences	3.24	2.70	**0.98**	.29	.16	.41	.13	.29	.30	.33	.66	.50	**0.98**									
11. Fear of Technological Advances	3.25	2.23	**0.86**	-.03	.00	-.07	.02	.07	-.04	.15	-.05	.11	.06	**0.82**								
12. Declining Cost	4.23	2.00	**0.90**	.14	.13	.15	.08	.13	.13	.16	.20	.12	.26	.09	**0.86**							
13. Cost	4.47	2.00	**0.98**	.07	-.01	.08	.13	-.01	.07	.06	-.06	.02	.00	.23	-.23	**0.98**						
14. Perceived Ease of Use	4.88	1.99	**0.93**	.14	.08	.11	.21	.19	.24	.04	.17	.16	.20	-.23	.03	.01	**0.88**					
15. Self-Efficacy	5.41	1.98	**0.98**	.10	.03	.14	.19	.23	.22	-.01	.12	.16	.17	-.21	.07	.02	.76	**0.96**				
16. Income[a]	NA	NA	**NA**	-.15	-.05	-.03	-.13	-.11	-.30	-.17	-.19	.02	-.14	.00	-.03	.09	-.03	.04	**NA**			
17. Sex[a]	NA	NA	**NA**	-.01	.04	-.19	.16	-.12	-.04	-.03	.00	.02	-.06	.10	-.08	-.05	-.09	-.15	-.26	**NA**		
18. Age[b]	44.73	18.15	**NA**	-.12	.26	-.14	.04	-.28	-.30	-.05	-.25	-.15	-.29	.16	-.04	-.01	-.25	-.33	.32	-.01	**NA**	
19. Behavioral Intention	3.17	2.25	**0.97**	.49	.21	.33	.26	.40	.45	.28	.46	.22	.40	-.19	.16	-.04	.36	.32	-.22	-.02	-.36	**0.96**

[a]This variable was coded as a nominal variable. It was measured in terms of non quantified distinct categories.

[b]This variable was coded as a continuous variable. It was measured using the respondents' birth date.

[c]Boldfaced elements on the diagonal of the correlation matrix represent the square root of the average variance extracted (AVE). For an adequate discriminant validity, the elements in each row and column should be smaller than the boldfaced element in that row or column.



We can see in Figure 2 that the path from fear of technological advances to behavioral intention is significant (t = 2.81, beta = -0.14, p < 0.005). Therefore, as we expected, in this study, fear of technological advances decreased the intention to buy a mobile phone for household use. And hypothesis 11 is supported. As shown in Figure 2, the t-value (1.85) and beta coefficient (0.13) got in the PLS structural equation model indicate that the path from perceived ease of use to behavioral intention is significant (p < 0.05). In this study, we expected that this largely used variable, originating from Davis's (1989) technology acceptance model (TAM), would increase the intention to buy a mobile

phone for household use. So our expectations revealed to be exact. As a result, hypothesis 14 is supported. Figure 2 shows that the path from age to behavioral intention is significant ($t = 1.95$, beta = -0.12, $p < 0.05$). Thus, as we anticipated, in this study, age decreased the intention to buy a mobile phone for household use. Consequently, hypothesis 18 is supported. As shown in Figure 2, the t-value (1.48) and beta coefficient (0.07) got in the PLS structural equation model indicate that the path from utility for security to behavioral intention is significant ($p < 0.10$). As we expected, the new variable utility for security that we added in this study to the research model proposed by Brown and Venkatesh (2005) increased the intention to buy a mobile phone for household use. But the level of significance is 0.10, while the level of significance accepted in the study is 0.05. As a result, hypothesis 4 is not supported. Finally, Figure 2 shows that the t-values and beta coefficients related to all the other variables in the model are too low to be significant. Consequently, hypotheses 2, 3, 6, 7, 9, 10, 12, 13, 15, 16, and 17 are not supported.

DISCUSSION AND CONCLUSIONS

The last section of the paper is devoted to a discussion about the results of the study and some conclusions. And to support our discussion and conclusions, we provide the reader with a more detailed view of the PLS structural equation model developed to test the research hypotheses, including the percentages of variance explained of variables (see Table 4).

Table 4
Beta Path Coefficients, T-Values, and Percentages of Variance Explained of Variables

Variable	*Beta*	*t*	R^2
Applications for Personal Use	0.30***	5.75	0.243
Utility for Children	-0.02	0.35	0.000
Utility for Work-Related Use	-0.07	1.08	0.002
Utility for Security	0.07†	1.48	0.002
Mobility	0.15**	2.73	0.054
Applications for Fun	0.05	0.73	0.001
Status Gains	0.07	1.19	0.005
Friends and Family Influences	0.18***	3.22	0.037
Secondary Sources' Influences	0.01	0.16	0.007
Workplace Referents' Influences	0.06	0.91	0.001
Fear of Technological Advances	-0.14**	2.81	0.030
Declining Cost	0.03	0.62	0.005
Cost	-0.02	0.47	0.002
Perceived Ease of Use	0.13*	1.85	0.066
Self-Efficacy	0.04	0.57	0.001
Income	-0.04	0.82	0.005
Sex	0.01	0.22	0.001
Age	-0.12*	1.95	0.031

†$p < 0.10$; *$p < 0.05$; **$p < 0.005$; ***$p < 0.001$.

As shown in Table 4 (see also Figure 2), the eighteen independent variables examined in the study explained 50 percent ($R^2 = 0.493$) of the variance in intention to buy a mobile phone for home use. And we can see in Table 4 that the six variables who showed to be significant (see also the significant beta path coefficients in Figure 2), that is, applications for personal use, perceived ease of use, mobility, friends and family influences, age and fear of technological advances,

explained alone 46.1 percent of the variance in intention to buy a mobile phone for household use, which is very high. Thus, these six variables are assuredly very important factors to take into account in future studies on the mobile phone and on the part of mobile phone providers, and more particularly applications for personal use which explained alone 24.3 percent of this variance (see Table 4). It is very interesting to see that one of the two variables that we added to the Brown and Venkatesh's (2005) theoretical research model, that is mobility, showed to be very significant ($p < 0.005$; see Table 4) in intention to buy a mobile phone for household use. Here is then another new variable which we might add to the integrated research model of MATH and household life cycle characteristics suggested by Brown and Venkatesh (2005). On the other hand, we are really surprised that our second variable utility for security not showed to be significant in intention to buy a mobile phone for household use at least to the level of significance 0.05 required in the study. We were quite assured that this variable would be very significant. But this one is significant at the level of significance 0.10 (see Table 4), which means, in our view, that it might also be added to the integrated research model of MATH and household life cycle characteristics proposed by Brown and Venkatesh (2005) to test in future studies. Indeed, the present study showed that people have, to some extent, the intention to buy a mobile phone for a matter of security.

In the large-scale study in which Brown and Venkatesh (2005) integrated MATH and some household life cycle characteristics (as moderating variables), the integrated model explained 74 percent of the variance in intention to adopt a personal computer for home use, a substantial increase of 24 percent over baseline MATH that explained 50 percent of the variance. In the present study, we used the integrated model proposed by Brown and Venkatesh (2005), with the exception of the household life cycle variable marital status (we added

sex instead), and we added two new independent variables to the model, namely, mobility and utility for security. But we used the other household life cycle variables as independent variables in our research model instead of moderating variables as did Brown and Venkatesh (2005). And the model explained 50 percent of the variance in intention to buy a mobile phone for household use (see Table 4 and Figure 2). Consequently, we returned to the same percentage of variance explained by MATH alone. So the result of our test seems, at first, not to be very conclusive. But, on the contrary, in this study, we found several interesting things to advance knowledge in this new and exciting field of adoption of technology in households.

First, we found six very important variables in the intention to buy a mobile phone by people, particularly one of the two new variables that we added to the Brown and Venkatesh's (2005) model, that is mobility, which showed to be very significant (see Table 4). These six variables are also very important to take into account by mobile phone providers to design new mobile phones still better adapted to people's needs and to do their sales marketing. Second, we found that people have, to some extent, the intention to buy a mobile phone for a matter of security, given our new variable utility for security showed to be significant at the level of significance 0.10, and practically at the level of significance 0.05 (see Table 4). Finally, the results of this study provided the evidence that it is probably better to use the household life cycle variables as moderating variables in the model, as did Brown and Venkatesh (2005), given the percentage of variance explained in intention to adopt a new technology in household by the model tested by these authors was significantly higher. We can then anticipate here that if we would been using the household life cycle variables as moderating variables in our theoretical research model instead of independent variables, the percentage of variance explained by the model in intention to adopt a mobile phone for household use would

been probably a little bit higher than those explained in intention to adopt a personal computer for household use by the model developed and tested by Brown and Venkatesh (2005), since the new variable mobility, which we added to the model proposed by these authors, explained alone 5.4 percent of the variance.

It would be interesting in future studies to add some other new variables to the actual theoretical research model (those suggested by Brown and Venkatesh (2005) augmented with the two new variables that we tested in the present study, depending, of course, on the technology examined) in order to try to explain yet more variance in intention to adopt a new technology in household. For example, the variable *lack of attention* might be added in social outcomes (a lot of people, particularly young and old people, are feeling to be alone in the actual stressing world, in which both men and women are working and get very busy, so the mobile phone might be a good way to communicate with other people everytime and everywhere to get the feeling to be less alone), the variable *social norm* might also be added in social outcomes (who knows, people might have the intention to buy a mobile phone just to do as everybody!), and the variable *control* might be added in utilitarian outcomes (some people might have the intention to adopt a mobile phone to control other people in their family or others; maybe another kind of Big Brother!). It would be also interesting to test the actual model in other situations and with other populations. For example, in a subsequent study, we tested the actual model with Atlantic Canadian people who own a mobile phone. We have then just changed the dependent variable behavioral intention for those of user satisfaction, given the respondents were already using a mobile phone at home. The results of the study will follow in a subsequent paper. It will be interesting to see whether the results remain the same as those got from people who do not yet own a mobile phone.

Regarding the limitations of this study, as pointed out by Brown and Venkatesh (2005), the primary limitation is the reliance on a single informant. It is possible that other members of the household would have provided different responses concerning the motivations to buy (or not) a mobile phone for household use. Future research in household adoption of technology should incorporate responses from multiple members of the household to truly assess the nature of household adoption. A second limitation of the study is that it was conducted in only one area in Atlantic Canada. If the study would have been carried out in the whole Atlantic Canada, its results would be of a higher level of generalization. But the fact that the sample of the study was a randomized sample allows a high level of generalization of its results. Another limitation of the study is the administration of the survey instrument over the telephone. Some respondents might have not very well understood some items of the survey instrument over the telephone and then provided more or less precise ratings on these items, introducing the possibility of some response bias. But the method we privileged in this study to administer the survey instrument is not an exception to the rule. Each method has its own limitations.

To conclude, much more research will be needed on the adoption of technology in households in order to better understand its impacts on people's daily life. The research will allow, among others, at least to minimize, if not to remove, some negative impacts of technology in people's daily life in the future and to develop new technologies still better adapted to people's needs. We will continue to inquire into this new and exciting field.

ACKNOWLEDGMENTS

The authors would sincerely like to thank professor Wynne W. Chin (University of Houston at Texas) who kindly offered to us a license of the last version of his structural equation modeling software PLS to perform the data analysis of this study. We are also grateful to the *Faculté des Études Supérieures et de la Recherche* (FESR) at the University of Moncton for its financial contribution to this study.

REFERENCES

Andonova, V. (2006). Mobile phones, the Internet and the institutional environment. *Telecommunications Policy*, *30*, 29-45.

Aoki, K. & E.J. Downes (2003). An analysis of young people's use of and attitudes toward cell phones. *Telematics and Informatics*, *20*(4), 349-364.

Balik, H.H., D. Turgut-Balik, K. Balicki & I.C. Özcan (2005). Some ocular symptoms and sensations experienced by long term users of mobile phones. *Pathologie Biologie*, *53*, 88-91.

Balikci, K., I.C. Ozcan, D. Turgut-Balik & H.H. Balik (2005). A survey study on some neurological symptoms and sensations experienced by long term users of mobile phones. *Pathologie Biologie*, *53*, 30-34.

Barclay, D., C. Higgins & R. Thompson (1995). The partial least squares (PLS) approach to causal modeling, personal computer adoption and use as an illustration. *Technology Studies*, *2*(2), 285-309.

Botelho, A. & L. Costa Pinto (2004). The diffusion of cellular phones in Portugal. *Telecommunications Policy*, *28*, 427-437.

Brown, S.A. & V. Venkatesh (2005). Model of adoption of technology in households: A baseline model test and extension incorporating household life cycle. *MIS Quarterly*, *29*(3), 399-426.

Campbell, S.W. & T.C. Russo (2003). The social construction of mobile telephony: An application of the social influence model to perceptions and uses of mobile phones within personal communication networks. *Communication Monographs*, *70*(4), 317-334.

Chae, M. & J. Kim (2004). Do size and structure matter to mobile users? An empirical study of the effects of screen size, information structure, and task complexity on user activities with standard Web phones. *Behaviour & Information Technology*, *23*(3), 165-181.

Chen, C.H., L.P. Khoo & W. Wan (2003). Evaluation of multicultural factors from elicited customer requirements for new product development. *Research in Engineering Design*, *14*, 119-130.

Chin, W.W. (1998). The partial least squares approach to structural equation modeling. In G.A. Marcoulides (Ed.), *Modern methods for business research* (pp. 295-336). Mahwah, NJ: Lawrence Erlbaum Associates.

Chuang, M.C., C.C Chang & S.H. Hsu (2001). Perceptual factors underlying user preferences toward product form of mobile phones. *International Journal of Industrial Ergonomics*, *27*, 247-258.

Compeau, D.R. & C.A. Higgins (1995a). Application of social cognitive theory to training for computer skills. *Information Systems Research*, *6*(2), 118-143.

Compeau, D.R. & C.A. Higgins (1995b). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*, *19*(2), 189-211.

Danko, W.D. & C.M. Schaninger (1990). An empirical evaluation of the Gilly-Enis updated household life cycle model. *Journal of Business Research*, *21*, 39-57.

Davie, R., C. Panting & T. Charlton (2004). Mobile phone ownership and usage among pre-adolescents. *Telematics and Informatics*, *21*(4), 359-373.

Davis, F.D. (1989). Perceived usefulness, perceived ease of use and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319-340.

DeVellis, R.F. (2003). *Scale development: Theory and applications* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Eby, D.W., J.M. Vivoda & R.M. St-Louis (2006). Driver hand-held cellular phone use: A four-year analysis. *Journal of Safety Research, 37*, 261-265.

Efron, B. & R.J. Tibshirani (1993). *An introduction to the bootstrap*. New York: Chapman and Hall.

Fillion, G. (2004). Publishing in the organizational sciences: An extended literature review on the dimensions and elements of an hypothetico-deductive scientific research, and some guidelines on "how" and "when" they should be integrated. *Academy of Information and Management Sciences Journal*, *7*(1), 81-114.

Fillion, G. (2005). *L'intégration des TIC dans la formation universitaire : une étude des résultats éducationnels des étudiants dans les contextes de présence et de non présence en classe*, Doctoral Thesis (Ph.D.), Faculty of Administration, Laval University, Quebec.

Funk, J. (2005). The future of the mobile phone Internet: An analysis of technological trajectories and lead users in the Japanese market. *Technology in Society*, *27*, 69-83.

Han, S.H. & S.W. Wong (2003). A systematic approach for coupling user satisfaction with product design. *Ergonomics*, *46*(13/14), 1441-1461.

Han, S.H., K.J. Kim, M.H. Yun, S.W. Hong & J. Kim (2004). Identifying mobile phone design features critical to user satisfaction. *Human Factors and Ergonomics in Manufacturing*, *14*(1), 15-29.

Isiklar, G & G. Büyüközhan (2007). Using multi-criteria decision making approach to evaluate mobile phone alternatives. *Computer Standards & Interfaces*, *29*(2), 265-274.

Karjaluoto, H., J. Pakola, M. Pietilä & R. Svento (2003). An exploratory study of antecedents and consequences of mobile phone usage in Finland. *Proceedings of the AMA Conference* (pp. 170-178), Chicago, August 15-18.

Kauffman, R.J. & A.A. Techatassanasoontorn (2005). Is there a global digital for digital wireless phone technologies?. *Journal of the Association for Information Systems*, *6*(12), 338-382.

Kwon, H.S. & L. Chidambaram (2000). A test of the technology acceptance model: The case of cellular telephone adoption. *Proceedings of HICSS-34*, Hawaii, January 3-6.

Lai, H.H., Y.C. Lin, C.H. Yeh & C.H. Wei (2006). User-oriented design for the optimal combination on product design. *International Journal of Production Economics*, *100*(2), 253-267.

LaRose, R. (1989). Advances in telecommunications. In H. Sawhney & G. Barnett (Eds.), *Understanding personal telephone behavior*. *Progress in Communication Science*, *15*.

Lee, Y.S., S.W. Hong, T.L. Smith-Jackson, M.A. Nussbaum & K. Tomioka (2006). Systematic evaluation methodology for cell phone user interfaces. *Interacting with Computers*, *18*, 304-325.

Limayem, M. & G. DeSanctis (2000). Providing decisional guidance for multicriteria decision making in groups. *Information Systems Research*, *11*(4), 386-401.

Limayem, M., P. Banerjee & L. Ma (2002). Impact of GDSS: Opening the black box. *Proceedings of the 6th Pacific Asia Conference on Information Systems (PACIS 2002)*, Tokyo, Japan, September 2-4.

Moore, G.C. & I. Benbasat (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, *2*(3), 192-222.

Ouellet, O. (2006). L'utilisation d'applications mobiles en entreprise stimulée par le téléphone évolué. *Direction Informatique*, 29 november. Retrieved July 6, 2007, from http://www.directioninformatique.com/DI/client/fr/DirectionsStrategiques/Nouvelles.asp?id=41272&bSearch=True.

Palen, L., M. Salzman & E. Youngs (2000). Going wireless: Bevavior & practice of new mobile phone users. *Proceedings of ACM CSCW* (pp. 201-210), Philadelphia, December 2-6.

Repacholi, M.H. (2001). Health risks from the use of mobile phones. *Toxycology Letters*, *120*, 323-331.

Rosenbloom, T. (2006). Driving performance while using cell phones: An observational study. *Journal of Safety Research*, *37*, 207-212.

Salvucci, D.D. & K.L. Macuga (2002). Predicting the effects of cellular phone dialing on driver performance. *Cognitive Systems Research*, *3*, 95-102.

Selwyn, N. (2003). Schooling the mobile generation: The future for schools in the mobile-networked society. *British Journal of Sociology and Education*, *24*(2), 131-142.

Straub, D.W. (1989). Validating instruments in MIS research. *MIS Quarterly*, *13*(2), 147-169.

Sullman, M.J.M. & P.H. Baas (2004). Mobile phone use amongst New Zealand drivers. *Transportation Research Part F*, *7*, 95-105.

Tam, M.C.Y. & V.M.R. Tummala (2001). An application of the AHP in vendor selection of a telecommunications system. *Omega*, *29*, 171-182.

Taylor, S. & P.A. Todd (1995). Understanding information technology usage: A test of competing models. *Information Systems Research*, *6*(2), 144-176.

Törnros, J. & A. Bolling (2006). Mobile phone use--effects of conversation on mental workload and driving speed in rural and urban environments. *Transportation Research Part F*, *9*, 298-306.

Treffner, P.J. & R. Barrett (2004). Hands-free mobile phone speech while driving degrades coordination and control. *Transportation Research Part F*, *7*, 229-246.

Venkatesh, V. & S.A. Brown (2001). A longitudinal investigation of personal computers in homes: Adoption determinants and emerging challenges. *MIS Quarterly*, *25*(1), 71-102.

Wagner, J. & S. Hanna (1983). The effectiveness of family life cycle variables in consumer expenditure research. *Journal of Consumer Research*, *10*, 281-291.

Wang, S.E. & Y.C. Sung (2003). Mobile phone consumption behavior analysis. *Proceedings of the Asia Pacific Management Conference* (pp. 1-11), China, April 23-25.

Webster, J. & J.J. Martocchio (1992). Mocrocomputer playfulness: Development of a measure with workplace implications. *MIS Quarterly*, *16*(2), 201-226.

Webster, J. & J.J. Martocchio (1993). Turning work into play: Implications for microcomputer software training. *Journal of Management*, *19*(1), 127-146.

Wei, R. (in press). Motivations for using the mobile phone for mass communications and entertainment. *Telematics and Informatics*.

Weinberger, Z. & E.D. Richter (2002). Cellular phones and effects on the brain: The head as an antenna and brain tissue as a radio receiver. *Medical Hypotheses*, *59*(6), 703-705.

Westerman, R. & B. Hocking (2004). Diseases of modern living: Neurological changes associated with mobile phones and radiofrequency radiation in humans. *Neuroscience Letters*, *361*, 13-16.

Wilska, T. (2003). The role of m-services in the well-being of young people. *Journal of Consumer Policy*, *26*(4), 441-463.

Yoo, Y. & M. Alavi (2001). Media and group cohesion: Relative influences on social presence, task participation, and group consensus. *MIS Quarterly*, *25*(3), 371-390.

APPENDIX A

List of Items

Following are the instructions that were provided to the participants to focus on the adoption of mobile phone at home.

Hello, my name is ... I am calling you concerning a study on the mobile phone conducted by two researchers at the Faculty of administration of the University... Do you have a mobile phone? If yes, thank you and bye. If no, could you answer our survey please? Your participation would be much appreciated, but it is free and you can refuse to answer some questions or stop to answer the survey at any time. The objective of the study is to better understand why people at home have the intention to buy a mobile phone. The survey takes about 10 minutes of your time to complete. And some questions about your personal information will be asked to you at the end of the survey. You will have the chance to win one of the 30 $10 Tim Horton gift certificates which will be drawn at the end of the data collection. For more details about the ethical aspects of the study, feel free to contact the *Faculté des Études Supérieures et de la Recherche* (FESR) at the University...

Please note that there is no right or wrong answer. For each question we would like to know on a scale from one to seven whether you strongly agree or strongly disagree, with one being strongly disagree and seven being strongly agree.

Variables	***Items (Seven-point Likert-type scales, with 1 = strongly disagree and 7 = strongly agree)***
Applications for Personal Use	I find that the mobile phone has tools for personal productivity.
	I find that the mobile phone has tools to support household activities.
	The mobile phone has software that helps with activities in the house.
Utility for Children	The mobile phone provides applications that my kid(s) can use.
	The mobile phone has useful applications for my child (or children).
	I find the mobile phone to be a useful tool for my child (or children).
Utility for Work-Related Use	The mobile phone is useful for me to work-at-home.
	The mobile phone provides applications related to my job.
	I am able to work at home more effectively because of applications on my mobile phone.
Utility for Security	I find the mobile phone to be useful for my security.
	The mobile phone provides applications related to my security.
	I find the mobile phone to be useful for the security of my family.
Mobility	A mobile phone allows having only this telephone to perform all personal and professional activities.
	If I had a mobile phone, I would use only this telephone to perform all my personal and professional activities.
	The applications provided by the mobile phone allow using only this telephone to perform all personal and professional activities.
Applications for Fun	The mobile phone provides many applications that are enjoyable.
	I enjoy playing games on the mobile phone.
	The mobile phone has applications that are fun.
	I am able to use the mobile phone to have fun.

Variables	***Items (Seven-point Likert-type scales, with 1 = strongly disagree and 7 = strongly agree)***
Status Gains	People who have a mobile phone at home have more prestige than those who do not.
	People who have a mobile phone at home have a high profile.
	Using a mobile phone is a status symbol.
Friends and Family Influences	My friends think I should use a mobile phone for personal use.
	Those in my social circle think I should use a mobile phone for personal use.
	My family members think I should use a mobile phone for personal use.
	My relatives think I should use a mobile phone for personal use.
Secondary Sources' Influences	Information from newspapers suggests that I should use a mobile phone for personal use.
	Information that I gather by watching TV encourages me to use a mobile phone for personal use.
	Based on what I have heard on the radio, I am encouraged to use a mobile phone for personal use.
Workplace Referents' Influences	My coworkers think I should use a mobile phone for personal use.
	My peers at work think I should use a mobile phone for personal use.
Fear of Technological Advances	The trends in technological advancement are worrisome to me.
	I fear that today's best mobile phones will be obsolete fairly soon.
	I am worried about the rapid advances in mobile phone technology.
Declining Cost	The cost of mobile phones is constantly declining.
	I believe the cost of mobile phones will continue to decline in the future.
	I think we will see better mobile phones for a lower price in the near future.
Cost	Mobile phones that are available today are too expensive.
	I think mobile phones are quite pricey.
	I consider a mobile phone to be a big-ticket item.
Perceived Ease of Use	The interaction with a mobile phone is clear and understandable.
	Interacting with a mobile phone does not require a lot of mental effort.
	I find a mobile phone to be easy to use.
	I find it easy to get a mobile phone to do what I want it to do.
Self-Efficacy	I feel comfortable using a mobile phone on my own.
	If I wanted to, I could easily operate a mobile phone on my own.
	I can use a mobile phone even if no one is around to help me.
Behavioral Intention	I intend to adopt a mobile phone for personal use.
	I predict that I would adopt a mobile phone for personal use.
	I expect to adopt a mobile phone at home in the near future.

Management Review: An International Journal Volume 2 Number 2 Winter 2007

Federal Funds Rate Changes: A Test of Market Efficiency

Frank W. Bacon
Longwood University
E-mail: baconfw@longwood.edu

Charles E. McMillan
Longwood University
E-mail: cemcmill@longwood.edu

ABSTRACT

This study tested the effect of two federal funds rate increase and two federal funds rate decrease announcements on stock price performance. Using standard risk adjusted event study methodology with the market model, the study analyzed 22,444 recent observations for the four event study periods from the thirty DOW firms with total market capitalization of three and one-half trillion dollars and the S&P 500 Index to examine the impact of the federal funds rate change announcements on stock price. Results show a significant negative market reaction prior to the announcements of both increases and decreases in the change in the federal funds rate. This suggests the market associates possible economic instability with any Federal Reserve intervention and views this discretionary monetary policy action as a negative signal. This is consistent with Milton Friedman's monetarist theory stating that Keynesian discretionary monetary policy creates rather than corrects economic instability. Findings support efficient market theory at the semi-strong form level as documented by Fama (1970). Similar too many other event study findings in the finance literature (stock splits, repurchases, dividend

announcements and etc.), effects of trading activity on the basis of the anticipated announcement surfaced prior to it being made public.

INTRODUCTION

How fast does the stock market react to new publicly announced information? According to Fama (1970), market efficiency can take on three forms: weak form efficiency, semi-strong form efficiency, and strong form efficiency. In a market that is weak form efficient, stock prices should react so quickly to all past information that investors are unable to earn an above normal return based on their knowledge of this information. Semi-strong form efficiency hypothesizes that stock price is a reflection of all publicly available information. Stock price should react efficiently enough to all public information that investors are unable to earn abnormal returns. Strong form efficiency hypothesizes that stock price is based upon both private and public information. In this case, the market reacts to an event based on information that is held within the confines of the firm prior to its public announcement, suggesting that investors were able to act on inside information illegally.

To test the market's efficiency with respect to information embedded in the public announcement of federal funds rate changes, this study uses standard event study methodology (Copeland, 2005). The study examines the effects of two increases and two decreases in the federal funds rate to test market efficiency and to see the impact of the Federal Reserve's discretionary monetary policy action on the stock market.

BACKGROUND AND PURPOSE

The Federal Reserve System plays a substantial role in the fluctuations of both the economy and the financial markets. The Federal Reserve controls monetary policy in the United States. One monetary policy gauge of the Federal Reserve System is the federal funds rate, which is considered one of the "primary indicators of the stance of monetary policy" (Mishkin 393). The federal funds rate is the interest rate at which overnight loans of reserves are made from one bank to another. The federal funds rate is set as a target rate by the Federal Open Market Committee (FOMC) and has a direct impact on interest rates throughout the economy. The market often reacts quickly to changes in the Federal Reserve's policy due to its significant impact on the money supply and the economy. Increases or decreases in the federal funds rate are immediately reflected in the stock market.

According to the efficient market hypothesis, the stock market should immediately respond to public announcements of federal funds rate changes making it impossible for an investor to "beat the market" or to make an above normal return on their investment by acting on such information. This study investigates whether an investor can, in fact, achieve an above normal return by capitalizing on public announcements of changes in the federal funds rate target. The study tests the efficient market hypothesis by assessing the investor's ability to earn an above normal return in the short run by acting on federal funds rate change announcements.

The purpose of this event study is to determine the impact of federal funds rate changes on the stock market in the short run. Moreover, this research tests how efficiently financial markets react to federal funds rate changes. This study tests the efficient market hypothesis by determining if equity markets react efficiently (quickly) in the

short-term to changes made by the Federal Reserve. Likewise, the study determines if the stock market reacts to announcements of federal funds rate changes at the weak-form, semi-strong form, or strong form level of market efficiency.

LITERATURE REVIEW

Fama (1970, 1976) defined market efficiency in three forms: weak-form, semi-strong-form and strong-form. Weak-form efficiency deals with the notion that no investor can earn an above economic return by developing trading rules based on past price or return information. Numerous studies (Fama, 1965; Alexander, 1961; Fama and Blume, 1966; Granger and Morgenstern, 1970) support the random walk theory, which assumes stock prices move at random and that it is impossible outperform the market without taking on additional risk.

If the market is weak form efficient, then stock prices will react so quickly to all past information that no investor can earn an above normal return (higher than the market return or the return on the S&P 500 index) by acting on this type of information. Annual accounting reports are an example of past information. These summarize the "past operations" of the firm and when mailed out are past information. If an investor receives the report and buys the firm's stock after discovering the firm had high earnings for the period and then stock price does not rise, the market is said to be efficient with respect to past information and is weak form efficient.

Semi strong-form market efficiency states that no investor can earn an above economic return based on any publicly available information. Tests of semistrong form efficiency (Fama, Fisher, Jensen, and Roll, 1969; Ball and Brown, 1968; Aharony and Swary, 1980, 1981; Joy, Litzenberger, and McEnally, 1977; Watts, 1978; Patell and Wolfson 1984; Scholes, 1972; Kraus and Stoll, 1972; Mikkelson and Partch,

1985; Dann, Mayers, and Raab, 1977) document the claim that no investor can earn an above normal return on publicly available information such as accounting statements, stock splits, dividend announcements, sale of stock announcements, repurchase of stock announcements, block trades, and earnings announcements.

If the market is semi-strong form efficient, then stock price reacts so quickly to all public information that no investor can earn an above normal return (higher than the market or the return on the S&P 500 index) by acting on this type of information. Public announcements of stock splits, repurchases, dividend increases are an example of public information. If one buys the stock on the announcement date and still does not earn an above normal return, the market is semi-strong form efficient.

Strong-form efficiency theory suggests that no investor can earn an above normal return from using any information, public or private. Studies on the validity of strong form efficiency offer mixed results (Jaffe, 1974; Finnerty, 1976; Givoly and Palmon, 1985; Friend, Blume, and Crockett, 1970; Jensen, 1968). A large body of literature cites numerous anomalies that question all forms of the market efficiency theory.

If the market is strong form efficient, then stock price reacts so quickly to all information (public and private) that no investor can earn an above normal return (higher than the market or the return on the S&P 500 index) by acting on this type of information. In this case, the market reacts to an event within the confines of the firm (or secret information) when it occurs even before it is publicly announced. For this to occur, investors must act on inside information, which is illegal. If one buys the stock on the event and still does not make an above normal return, the market is strong form efficient.

"Because information is reflected in prices immediately, investors should only expect to obtain a normal rate of return" (Ross 342). However, does market efficiency hold for public announcements of federal funds rate changes? Weak form efficiency states that a company's stock price is based on past prices and information, while strong form efficiency argues that the price is a reflection of all information, public and private. While both of these theories have merit, this study asserts that federal funds rate changes are reflected in the price of a company's stock according to the semi-strong form of efficiency, indicating that all public information available determines the price of the stock.

METHODOLOGY

The study sample includes the 30 large firms comprising the DOW Jones Industrial Index (DOW). Table 1 provides a description of the study sample. The study tests how quickly the 30 DOW firms react to four public announcements of a federal funds rate change. Analysis of the rate change announcement includes 22,444 observations of the 30 DOW firms and the Standard & Poor's 500 Index (S&P 500) during the calendar years 2000, 2001, 2003, and 2004.

TABLE 1. DESCRIPTION OF THE STUDY SAMPLE

Firm (Ticker)	Market Cap (billions)	Sales (Thousands)	Total Assets (Thousands)
Alcoa (AA)	20.37	23,478,000	32,609,000
American International Group (AIG)	163.28	97,987,000	798,660,000
American Express (AXP)	58.51	29,115,000	192,638,000
Boeing (BA)	54.18	52,457,000	53,963,000
Citicorp (C)	229.09	108,276,000	1,484,101,000
Caterpillar (CAT)	33.11	30,251,000	43,091,000
Dupont (DD)	38.44	27,995,000	35,632,000
Walt Disney (DIS)	46.19	30,752,000	53,902,000
General Electric (GE)	357.57	91,107,000	750,507,000
General Motors (GM)	15.98	185,524,000	448,507,000
Home Depot (HD)	84.86	73,094,000	38,097,000
Honeywell (HON)	28.4	25,601,000	31,062,000
Hewlett Packard (HPQ)	78.99	79,905,000	76,138,000
International Business Machines (IBM)	132.98	96,293,000	109,183,000
Intel (INTC)	141.05	34,209,000	48,143,000
Johnson and Johnson (JNJ)	190.59	47,348,000	53,317,000
J. P. Morgan (JPM)	123.41	56,931,000	1,157,248,000
Coca Cola (KO)	100.07	21,962,000	31,327,000
Mcdonalds (MCD)	40.6	19,064,700	27,837,500
3 M (MMM)	57.3	20,011,000	20,708,000
Altria Group (MO)	151.44	81,832,000	96,175,000
Merck (MRK)	57.48	22,938,600	42,572,800
Microsoft (MSFT)	265,46	39,788,000	70,815,000
Pfizer (PFE)	156.62	52,516,000	123,648,000
Proctor and Gamble (PG)	134.9	56,741,000	61,527,000
SBC Communications (SBC)	75.99	40,787,000	108,844,000
United Technologies (UTX)	52.17	37,445,000	40,035,000
Verizon Communications (VZ)	81.63	71,283,000	165,958,000
Wal Mart Stores (WMT)	190.32	287,989,000	120,223,000
Exxon Mobil (XOM)	349.12	298,035,000	195,256,000
MEAN	117.00	30,883,353.33	148,607,750

This study uses the standard risk adjusted event study methodology from the literature to test the stock market's response to the Federal Reserve's announcements of federal funds decreases on August 21, 2001 and June 25, 2003 and federal funds increases on September 21, 2004 and March 21, 2000. The announcement date (day 0) is the date of the federal funds rate change announcement. The required historical financial data, i.e. the stock price and S&P index during the event study period were obtained from the internet website http://finance.yahoo.com/.

- The historical stock prices of the 30 DOW companies, and S&P 500 index, for the event study duration of -180 to +30 days (with day –30 to day +30 defined as the event period and day 0 the announcement date) were obtained.
- Then, holding period returns of the companies (R) and the corresponding S&P 500 index (R_m) for each day in this study period were calculated using the formula:

  $$\text{Current daily stock return} = \frac{\text{(current day close price} - \text{previous day close price)}}{\text{previous day close price}}$$

  $$\text{Current daily index return} = \frac{\text{(S\&P current close- S\&P previous close)}}{\text{S\&P previous close}}$$
- A regression analysis was performed using the actual daily return of each company (dependent variable) and the corresponding S&P 500 index daily return (independent variable) over the pre-event period day –180 to –31 (period prior to the event period of day –30 to day +30) to obtain the alpha (the intercept) and the beta (standardized coefficient). Table 2 shows alphas and betas for each firm.

TABLE 2. STUDY SAMPLE ALPHAS AND BETAS

Firm	Alpha	Beta	Firm	Alpha	Beta
AA	-0.00027	1.666758	JNJ	0.000751	0.524563
AIG	-2.8E-05	1.230763	JPM	0.000646	1.12492
AXP	0.00075	0.853516	KO	-0.00079	0.716781
BA	0.001149	1.207695	MCD	0.000964	0.712793
C	3.56E-05	1.11359	MMM	-0.0002	1.141891
CAT	0.000396	1.43501	MO	-0.00015	0.645091
DD	4.67E-05	0.979456	MRK	-0.00201	0.905285
DIS	0.000769	1.264681	MSFT	0.000381	0.912696
GE	0.000778	1.106702	PFE	-0.00067	1.022084
GM	-0.00101	1.226134	PG	0.000335	0.652666
HD	0.000994	1.122348	SBC	0.000357	0.876562
HON	0.000556	1.389645	UTX	0.000222	0.992843
HPQ	-0.00043	1.450021	VZ	0.001023	0.849081
IBM	9.09E-05	0.779778	WMT	0.000305	0.722536
INTC	-0.00122	1.337728	XOM	0.001062	0.806286

- For this study, in order to get the normal expected returns, the risk-adjusted method (market model) was used. The expected return for each stock, for each day of the event period from -30 to +30, was calculated as:
  E(R) = alpha + Beta (R_m), where R_m is the return on the market i.e. the S&P 500 index.
- Then, the Excess return (ER) was calculated as the Actual Return (R) minus the Expected Return E(R)
- Average Excess Returns (AER) were calculated (for each day from -30 to +30) by averaging the excess returns for all the firms for given day.
  AER = Sum of Excess Return for given day / n, where n = number of firms is sample i.e. 30
- Also, Cumulative AER was calculated by adding the AERs for each day from -30 to +30.

- The graph of Cumulative AER was plotted for the event period day -30 to day +30.

QUANTITATIVE TESTS AND RESULTS

Did the market react to the announcements of the increase or decrease in the federal funds rate? Was the information surrounding the event significant? One would expect the average excess daily returns (Day -30 to Day +30) to be significantly different from 0 and therefore significantly different from cumulative average excess returns over the corresponding time period if the information surrounding the event impounds new, significant information on the market price of the firms' stock. If a significant risk adjusted difference is observed, then this type of information did in fact significantly impact stock price as hypothesized. To statistically test for a difference in the risk adjusted daily average excess returns and the cumulative average excess daily returns (for the firms over the time periods day -30 to day +30), a paired sample t-tests was used for the combined federal funds rate increases and the same for the rate decreases and found a statistically discernable difference at the 1% level of significance for the DOW firms. This finding supports our hypothesis of the significant effect of the rate change information around the announcement based on the sample's reaction.

Is it possible to isolate and observe the sample's daily response to the announcement of either the decrease or the increase in the federal funds rate from day -30 to day +30? If so, at what level of efficiency (weak, semi-strong, strong form according to efficient market theory) did the market respond to the information and what are the implications for market efficiency and the Federal Reserve's discretionary monetary policy? Another purpose of this analysis tests the efficiency of the market in reacting to the announcement of federal

funds rate change events. Specifically, do we observe weak, semi-strong, or strong form market efficiency as defined by Fama, 1970, in the efficient market hypothesis? The key in the analysis or tests is to determine if the CAER (Cumulative Average Excess Return) are significantly different from zero or that there is a visible graphical or statistical pattern between time and CAER. T-tests of daily average excess return and cumulative average excess return tested different from zero at the 1% level of significance. Likewise, observation of Exhibit 1 (graph of CAER from day –30 to day +30 for two federal funds rate decreases) and Exhibit 2 (graph of CAER from day –30 to day +30 for two federal funds rate increases) confirms the response by the sample of 30 DOW firms significant reaction prior to the announcement of the federal funds rate change event.

Exhibit 1. Cumulative Average Excess Return Over Event Period For Federal Funds Decreases on August 21, 2001 and June 25, 2003

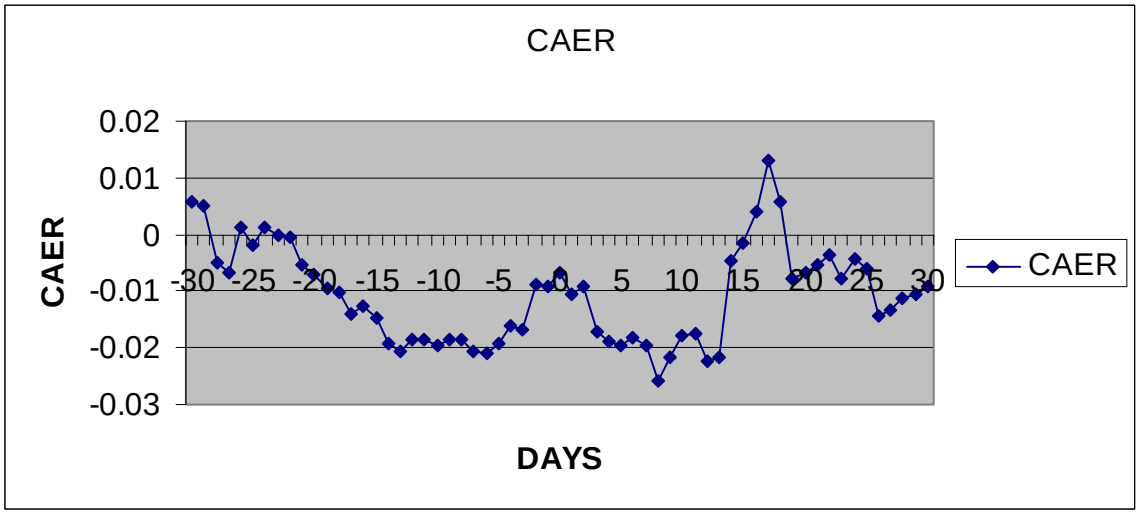
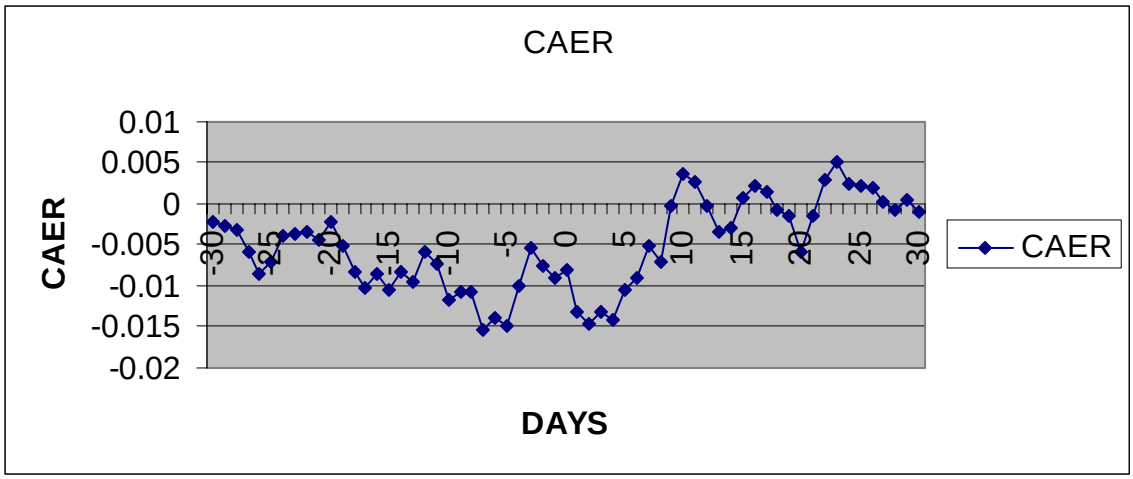


Exhibit 2. Cumulative Average Excess Return Over Event Period For Federal Funds Increases on September 21, 2004 and March 21, 2000



Interestingly for both rate changes, the graphs demonstrate that the federal funds rate change announcement had a negative impact on the firms' share price up to 25 days prior to day 0, the announcement date. This is consistent with the semi-strong form market efficiency hypothesis which states that the stock price reflects all publicly available information. Apparently, the market associates possible economic instability with any Federal Reserve intervention into the adjustment of market interest rates and views this discretionary monetary policy action as a negative signal. This is consistent with Milton Friedman's monetarist theory stating that Keynesian discretionary monetary policy creates rather than corrects economic instability. According to the evidence, the market appears to side with Friedman by reacting negatively even 25 days before the Federal Open Market Committee Meeting.

Likewise post event (day 0) for the federal funds rate decreases and increases, the stock price seems to rebound to pre event period levels or higher. As expected, the rate decrease elicited a stronger positive market reaction though delayed by some 10 days. Further investigation is necessary to determine if extraneous events other than the rate change announcements (i.e. strong positive or negative economic news during the event study periods) may have been the driving force behind these results. Likewise, the study needs to include a larger sample of rate change events.

CONCLUSION

Summary

This study tested the effects of two federal funds rate increase announcements and two federal funds rate decrease announcements since year 2000 on stock price performance as measured by the 30 DOW companies. Using standard risk adjusted event study methodology with the market model, the study analyzed 22,444 recent observations on the thirty DOW firms with total market capitalization of three and one-half trillion dollars and the S&P 500 Index for four rate change announcements to examine the impact of the federal funds rate change announcement on stock price.

Appropriate statistical tests for significance were conducted. Results show a significant negative market reaction prior to the announcement of both increases and decreases in the federal funds rate. Apparently, the market associates possible economic instability with any Federal Reserve intervention into adjusting market interest rates and views this discretionary monetary policy action as a negative signal. This is consistent with Milton Friedman's monetarist theory stating that

Keynesian discretionary monetary policy creates rather than corrects economic instability.

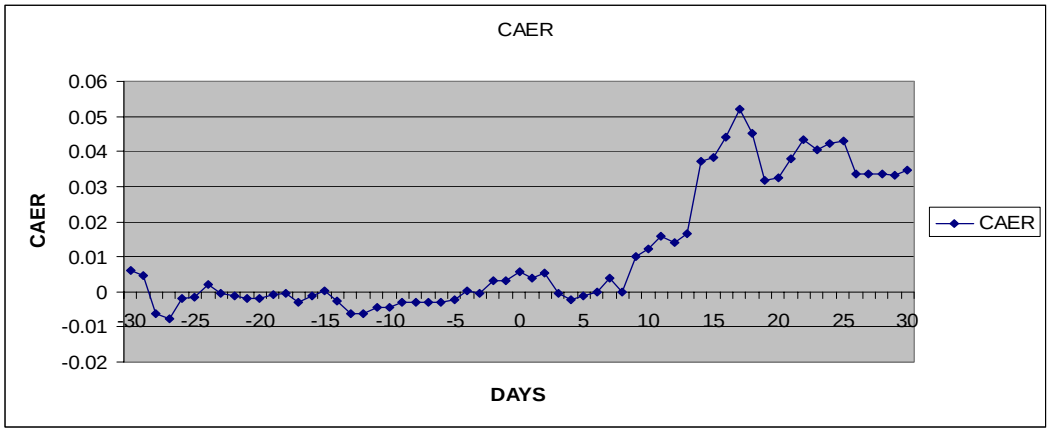
Findings also support efficient market theory at the semi-strong form level as documented by Fama (1970). Similar too many other event study findings in the finance literature (stock splits, repurchases, dividend announcements and etc.), apparently trading activity on the basis of the anticipated announcement surfaces prior to it being made public.

Study Limitations and Further Research

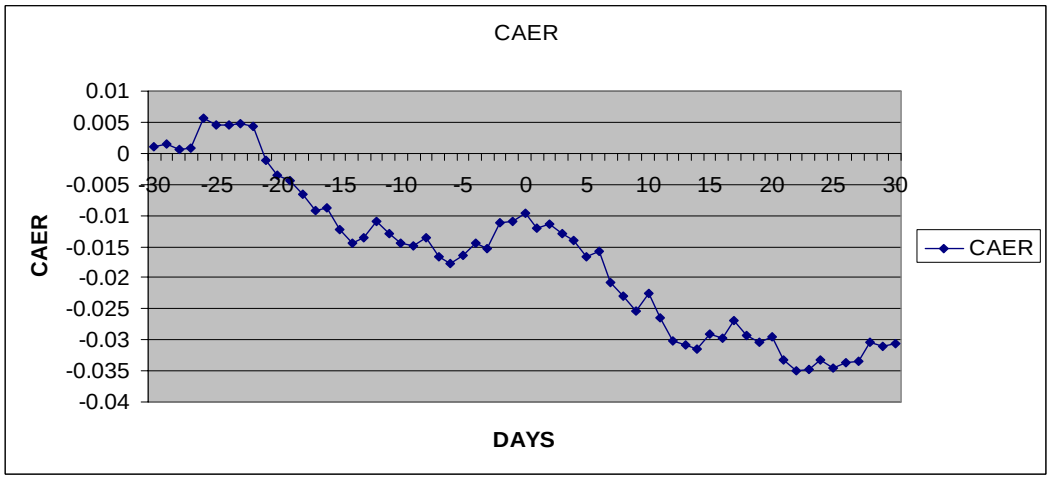
This type of event study aims to isolate the effects of the federal funds rate change event on the stock price of the sample of firms selected. However, to assure that the study results are free of extraneous effects, further analysis is necessary to identify and control for other possible events (i.e. hurricanes, terrorist attacks, or oil price changes) that could have occurred during the study's event periods covered by the sample of the four federal funds rate changes analyzed in this paper. Without data availability and analysis tools restraints, a larger sample of federal funds rate changes cleansed of extraneous effects is necessary to strengthen the results presented. Likewise, to further enhance findings of this study, the sample of firms representing the market should be financial firms. Since the assets of financial firms face significant interest rate sensitivity, a stronger hypothesis of the effects of changes in the federal funds rate on the stock price of a sample of financial firms arises.

APPENDIX

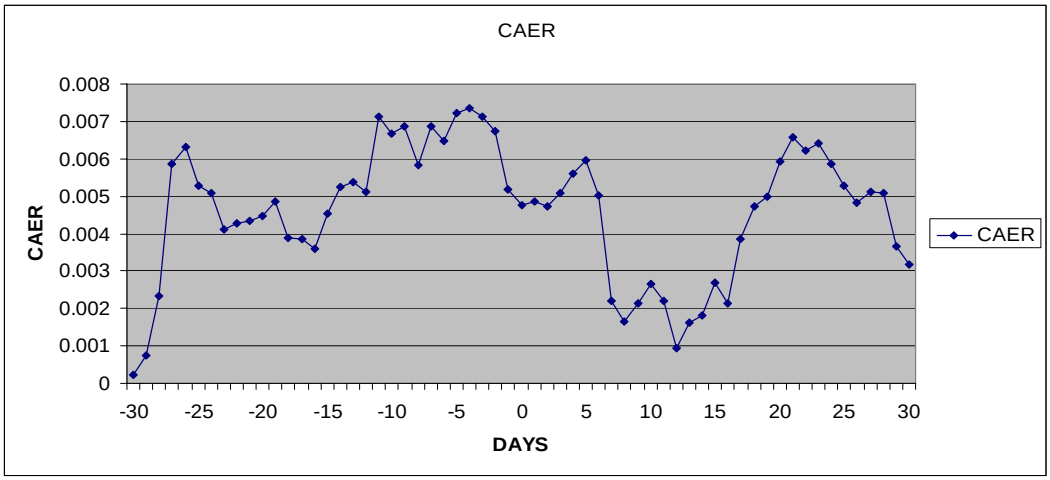
Graph of 8/21/2001 Decrease



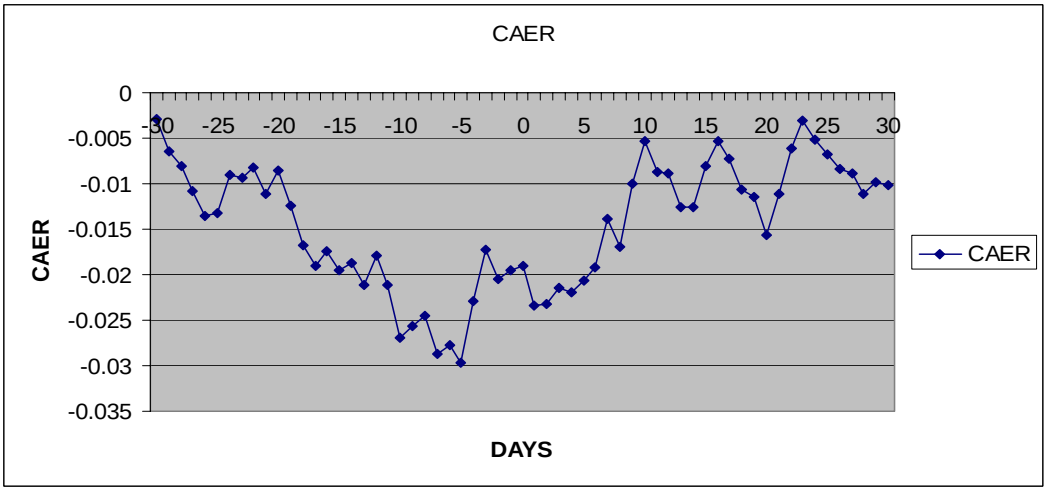
Graph of 6/25/2003 Decrease



Graph of 9/21/2004 Increase



Graph of 3/21/2000 Increase



REFERENCES

Aharony, J., and I. Swary, "Quarterly Dividend and Earning Announcements and Stockholders' Returns: An Empirical Analysis," *Journal of Finance*, March 1980, 1-12.

Alexander, S. S., "Price Movements in Speculative Markets: Trends or Random Walks," *Industrial Management Review*, May 1961, 7-26.

Ball, R., and P. Brown, "An Empirical Evaluation of Accounting Income Numbers," *Journal of Accounting Research*, Autumn 1968, 159-178.

Black, F., "Yes Virginia, There is Hope: Tests of the Value Line Ranking System," *Financial Analysts Journal*, September/October 1973, Vol. 29, 10-14.

Branch, B., "A Tax Loss Trading Rule," *Journal of Business*, April 1977, 198-207.

Bray, A., and P. Gompers, "Myth or Reality? The Long-Term Underperformance of Initial Public Offerings: Evidence from Venture and Nonventure Capital-Backed Companies," *Journal of Finance*, 1997, Vol. 52, 1791-1821.

Brennan, M., and T. Copeland, "Beta Changes around Stock Splits," *Journal of Finance*, September 1988a, 1009-1013.

Brennan, M., and T. Copeland, "Stock Splits, Stock Prices, and Transaction Costs," *Journal of Financial Economics*, December 1988b.

Chen, N. F., Copeland, T. E., and Mayers, D., "A Comparison of Single and Multifactor Portfolio Performance Methodologies," *Journal*

of Financial and Quantitative Analysis, December 1987, Vol. 22, No. 4, 401-417.

Copeland, T., *Financial Theory and Corporate Policy* (The Addison-Wesley Series in Finance, 4th ed.) United States: Addision-Wesley (2005).

Copeland, T., "Liquidity Changes Following Stock Splits," *Journal of Finance*, March 1979, 115-141.

Copeland, T. E., and D. Mayers, "The Value Line Enigma (1965-1978): A Case Study of Performance Evaluation Issues," *Journal of Financial Economics*, November 1982, 289-321.

Dann, L., D. Mayers, and R. Raab, "Trading Rules, Large Blocks and the Speed of Adjustment," *Journal of Financial Economics*, January 1977, 3-22.

Dharan, B., and D. Ikenberry, "The Long-Run Negative Drift of Post-Listing Stock Returns," *Journal of Finance*, 1995, Vol. 50, 1547-1574.

Dyl, E., *The Effect of Capital Gains Taxation on the Stock Market*, Ph.D. dissertation, Stanford University Graduate School of Business, August 1973.

Fama, E. F., "The Behavior of Stock Market Prices," *The Journal of Business*, January 1965, 34-105.

Fama, E. F., "Efficient Capital Markets: A Review of Theory and Empirical Work," *Journal of Finance*, May 1970, 383-417.

Fama, E. F., *Foundations of Finance*. Basic Books, New York, 1976.

Fama, E. F., "Market Efficiency, Long-Term Returns, and Behavioral Finance," *Journal of Financial Economics*, September 1998, 283-306.

Fama, E. F., and M. Blume, "Filter Rules and Stock Market Trading Profits," *Journal of Business*, January (spec. supp.) 1966, 226-241.

Fama, E. F., L. Fisher, M. Jensen, and R. Roll, "The Adjustment of Stock Prices to New Information," *International Economic Review*, February 1969, 1-21.

Farrar, D. E., *The Investment Decision under Uncertainty*. Prentice-Hall, Englewood Cliffs, N.J., 1962.

Finnerty, J. E., "Insiders and Market Efficiency," *Journal of Finance*, September 1976, 1141-1148.

Foster, T., III, and D. Vickrey, "The Information Content of Stock Dividend Announcements," *Accounting Review*, April 1978, 360-370.

French, K., "Stock Returns and the Weekend Effect," *Journal of Financial Economics*, March 1980, 55-69.

Friend, I., M. Blume, and J. Crockett, *Mutual Funds and Other Institutional Investors*. McGraw-Hill, New York, 1970.

Friend, I., and D. Vickers, "Portfolio Selection and Investment Performance," *Journal of Finance*, September 1965, 391-415.

Givoly, D., and D. Palmon, "Insider Trading and the Exploitation of Inside Information: Some Empirical Evidence," *Journal of Business*, January 1985, 69-87.

Granger, C. W. J., and O. Morgenstern, *Predictability of Stock Market Prices*. Heath Lexington Books, Lexington, Mass., 1970.

Grinblatt, M., R. Masulis, and S. Titman, "The Valuation Effects of Stock Splits and Stock Dividends," *Journal of Financial Economics*, December 1984, 451-490.

Gultekin, M., and N. B. Gultekin, "Stock Market Seasonality: International Evidence," *Journal of Financial Economics*, December 1983, 469-481.

Henricksson, R., "Market Timing and Mutual Fund Performance: An Empirical Investigation," *Journal of Business*, January 1984, 73-96.

Ikenberry, D., J. Lakonishok, and T. Vermaelen, "Market Underreaction to Open Market Share Repurchases," *Journal of Financial Economics*, 1995, Vol. 39, 181-208.

Ikenberry, D., G. Rankinem and E. Stice, "What Do Stock Splits Really Signal?" *Journal of Finance and Quantitative Analysis*, 1996, Vol. 31, 357-377.

Jaffe, J., "Thee Effect of Regulation Changes on Insider Trading," *Bell Journal of Economics and Management Science*, Spring 1974, 93-121.

Jensen, M., "The Performance of Mutual Funds in the Period 1945-64," *Journal of Finance*, May 1968, 389-416.

Jensen, M., "Risk, The Pricing of Capital Assets, and the Evaluation of Investment Portfolios," *Journal of Business*, April 1969, 167-247.

Joy, M., R. Litzenberger, and R. McEnally, "The Adjustment of Stock Prices to Announcements of Unanticipated Changes in Quarterly Earnings," *Journal of Accounting Research*, Autumn 1977, 207-225.

Keim, D., "Size-Related Anomalies and Stock Return Seasonality: Further Empirical Evidence," *Journal of Financial Economics*, June 1983, 13-32.

Kraus, A., and H. R. Stoll, "Price Impacts of Block Trading on the New York Stock Exchange," *Journal of Finance*, June 1972, 569-588.

Lakonishok, J., and T. Vermaelen, "Anomalous Price Behavior around Repurchase Tender Offers," *Journal of Finance*, 1990, Vol. 45, 455-477.

Logue, D. E., "On the Pricing of Unseasoned Equity Offerings: 1965-1969," *Journal of Financial and Quantitative Analysis*, January 1973, 91-104.

Loughran, T., and J. Ritter, "The New Issues Puzzle," *Journal of Finance*, 1995, Vol. 50, 23-51.

Lowrey, M., and G. W. Schwert, "IPO Market Cycles: Bubbles or Sequential Learning?" *Journal of Finance*, June 2002, 1171-1200.

Mains, N. E., "Risk, the Pricing of Capital Assets, and the Evaluation of Investment Portfolios: Comment," *Journal of Business*, July 1977, 371-384.

McDonald, J. G., and A. K. Fisher, "New Issues Stock Price Behavior," *Journal of Finance*, March 1972, 97-102.

Mikkelson, W., and M. Partch, "Stock Price Effects and the Costs of Secondary Distribution," *Journal of Financial Economics*, June 1985, 165-194.

Madura, J. (2003). *Financial Markets and Institutions* (J. W. Calhoun & A. McGuire, Eds., 6th ed.). United States: Thomson South-Western.

Mitchell, M., and E. Stafford, "Managerial Decisions and Long-Term Stock Price Performance," working paper, Graduate School of Business, University of Chicago, 1997.

Ohlson, J., and S. Penman, "Volatility Increases Subsequent to Stock Splits: An Empirical Aberration," *Journal of Financial Economics*, June 1985, 251-266.

Patell, J., and M, Wolfson, "Anticipated Information Releases Reflected in Call Option Prices," *Journal of Accounting and Economics*, August 1979, 117-140.

Reilly, F. K., and K. Hatfield, "Investor Experience with New Stock Issues," *Financial Analysts Journal*, September/October 1969, 73-80.

Reinganum, M., "The Anomalous Stock Market Behavior of Small Firms in January: Empirical Tests for Tax-Loss Selling Effects," *Journal of Financial Economics*, June 1983, 89-104.

Roll, R., "The Turn-of-the-Year Effect and the Return Premia of Small Firms," *Journal of Portfolio Management*, Winter 1983, 18-28.

Ross, S. (2005). *Corporate Finance* (Stephen A. Ross, Randolph W. Westerfield, Jeffery Jaffe.- 6th ed.). United States: McGraw-Hill Companies.

Scholes, M., "The Market for Securities: Substitution vs. Price Pressure and the Effects of Information on Share Prices," *Journal of Business*, April 1972, 179-211.

Sharpe, W. F., "Mutual Fund Performance," *Journal of Business*, January 1966, 119-138.

Shaw, D., "The Performance of Primary Stock Offerings: A Canadian Comparison," *Journal of Finance*, December 1971, 1103-1113.

Stickel, S., "The Effect of Value Line Investment Survey Rank Changes on Common Stock Prices," *Journal of Financial Economics*, March 1985, 121-144.

Stickney, C. P., Jr., *A Study of the Relationships of Accounting Principles and Common Stock Prices of Firms Going Public*, Ph.D. dissertation, Florida State University, Tallahassee, 1970.

Summers, L. H. (1986, July). Does *the Stock Market Rationally Reflect Fundamental Values?* Journal of Finance*, 41*(3), 591-601.

Stigler, G., "Public Regulation of Security Markets" *Journal of Business*, April 1964, 117-142.

Szwewczyk, S. H., Tsetsekos, G. P., & Zantout, Z. (1997, Spring). *Do Dividend Omissions Signal Future Earnings or Past Earnings?* Journal of Investing.

Treynor, J. L., "How to Rate Mutual Fund Performance," *Harvard Business Review*, January/February 1965, 63-75.

Watts, R., "Systematic 'Abnormal' Returns after Quarterly Earnings Announcements," *Journal of Financial Economics*, June/September 1978, 127-150.

Weinstein, M., "The Seasoning Process of New Corporate Bond Issues," *Journal of Finance*, December 1978, 1343-1354.

Woolridge, J. R., "Ex-date Stock Price Adjustment to Stock Dividends: A Note," *Journal of Finance*, March 1983a, 247-255.

Woolridge, J. R., "Stock Dividends as Signals," *Journal of Financial Research*, Spring 1983b, 1-12.

Transforming Process from Traditional Industrialization to Modern Industrialization in China: Ecological Perspective

Lijun Chai
College of Economics and Management
Qingdao University of Science &Technology
Qingdao, Shandong, P. R. China
Email: chailijun1008@126.com

Liying Chai
College of Politics and Law
Qingdao University of Science &Technology
Qingdao, Shandong, P. R. China
Email: chailiying640119@126.com

ABSTRACT

The paper analyzes the feature of modern industrialization, points that it is a feasible method to go on a modern industrialized way by building and developing ecological industry according to the principle of recycling ecological economy. As the heavy industry city an example and expounds the fundamental train of thought of fostering the development of ecological industry and building recycling ecological economic mode, then integrate measures like clean production, ecological industry and ecological agriculture to make them a systematic strategy.

Keywords: *Ecological Industry, Traditional Industrialization; Modern Industrialization*

INTRODUCTION

From 2002, China started to drive industrialization by information industry and foster information industry by industrialization and go on a modern industrialization way of high-tech intensiveness, good ecological economic benefit, lower consumption of resource, lower pollution of environment and full use of human resource. To understand modern industrialization, today, people focus more on information industry driving, high-tech industry development and remaking traditional industry. However, seeing from the trend of developed countries, there should be another paralleled way that is to build and develop modern ecological industry according to the principle of recycling ecological economy. The objectives of this study are to explore transforming process from traditional to modern industrialization in China in terms of ecological perspective and to provide the management and public policy makers with insights of modern industrialization. T here should be another paralleled way that is to build and develop modern ecological industry according to the principle of recycling ecological economy.

In the first section, an introduction deals with the rationale for doing a study on transforming process initiatives of a given target place. In section two, a literature review related to the current study is addressed. Then, in section three, a positive analysis o the way of modern industrialization discusses with varied study aspects. Section four shows a way for building up recycling economy mode. In a final section, a conclusion gives some future directions and summary.

FEATURES DIFFERING MODERN INDUSTRIALIZATION FROM TRADITIONAL INDUSTRIALIZATION

The feature of traditional industrialization is the high input and high consumption at the beginning of production system and high

pollution during production. This kind of mode relies on natural resource but seldom considers the impact on ecological environment. When dealing with the relationship between ecological economy and environment, we always develop ecological economy first then control pollution or pollute environment first then control pollution. Dong furen, a famous ecological economist, pointed that the difference between modern industrialization and others is: it no longer wastes resource and pollute environment, instead it carries on sustainable development strategy. Traditional industrialization always wastes resource, pollute environment first and then takes measures to control. Modern industrialization is different from traditional industrialization, which was taken by most developed countries and China in the past. Compared with traditional industrialization, the features of modern industrialization are reviewed.

Ecological economic mode of low cost and high effectiveness

The modern industrialization makes fully use of the newest science and technology, which focuses on, technology and knowledge and which is low resource consumption and high output. While Traditional industrialization is the extensive ecological economy with high consumption of resource and energy and low output. The output is accomplished by high consumption so the ecological economic benefit is quite low.

Ecological industrial chain

In China, Traditional industrialization is one-way linear ecological economy of resource-product-wastes-pollution with a feature of high consumption, high pollution, low utilization and unsustainable development. While modern industrialization builds a kind of ecological chain during producing and consuming, which uses wastes produced by upper-level products as the resource of lower-level products and makes the ecological economic activity a material

recycled circle process of resource-product-recyclable resource-reproducible products. All resource and energy can be made reasonable use of with a feature of low consumption, low pollution, high utilization and sustainable development in this continual ecological economic recycling.

Clean producing way

Facing high demanding market of industrial products. Traditional industrialization uses extensive producing way, consumes all kinds of cheap resource especially natural resource in a high strength. It changes resource into wastes, which intensifies the environment pollution. While through clean producing way, at the same time it doesn't do any harm to the environment. Modern industrialization makes use of all the resource and energy in the recycling of resource-producing-consuming-recycled resource.

The input structure of nonmaterial resource

In traditional industrialization system, there is a material structure in the basis of resource input especially natural resource, labor force and traditional technology. While the structure of resource input in modern industrialization is a nonmaterial structure of less material and energy consumption in the premise of meeting the need of people's life. In modern industrialization, by less relying on natural resource, the production and life pollution get less and people's living environment gets improved. High-tech and knowledge are the most important resource inputs.

Technology innovation way focusing both on resource development and protection

American scholars revealed the asymmetry between resource development, technology utilization and the technology development of environment protection in 1960s and 1970s. They

indicated that most technology improvement comes from the reality of resource development, so traditional industrialization puts more emphasis on how to develop and utilize technology, how to lower developing cost, how to raise the utilization rate of resource. These technologies can foster the development and utilization of resource objectively but may do harm to the protection and sustainable development of environment. On the other hand, technology improvement will think less of the protection and sustainable development of environment. Technology improvement should incline to it because of the underdevelopment of environment protection technology.

In a word, the fundamental points of modern industrialization lie in changing old ideas of traditional industrialization, giving new connotation to traditional industrialization, controlling population, saving resource, focusing on ecological construction and environment protection, raising the scientific and technological content of industrial products, lowering resource consumption and environment pollution, realizing the harmonious development of economic construction, population, resource and environment, realizing mutual promotion of industrialization and sustainable development, accelerating our industrialization process on the condition of increasing development level and quality of industrialization and making sure of less environment pollution and low resource consumption.

RECYCLING ECONOMY-A NECESSARY WAY OF MODERN

Origin, basic rule and practice of recycling economy

The recycling economy can be traced back to 1960s when an American economist published an article titled “Economic View of Spaceship” in which he considered the earth as a spaceship which makes its living by consuming its limited resource. The theory of spaceship means that people’s social and economic activity should

change from learning the machinery principle featured by linear to the ecology principle featured by feedback. The idea of recycling was considered a theory of forerunner what people consider was how to deal with pollutions to reduce its harm. When produced, which is the so-called end-dealing way. In 1980s, people realized that we should deal with the wastes through a resource way. However, for the fundamental question like whether the production of wastes is reasonable or whether we should prevent pollution in production and consumption, most countries are shortsighted and lack good measures in policies.

In all the environment protection activity in 1970s and 1980s focused more on the ecological result of economic activities but the economic operation system was still out of people's consideration. In 1990s especially in the years when the sustainable development strategy became the dominant idea, people raised series ideas of recycling economy like "non-emission factory", "clean production", "product lifecycle", "designing for environment". The prevention of compass of competency took the place of end dealing and became the main trend in policies of environment and development, recycling utilization and reduction of wastes was integrated to be a recycling economic strategy featured by avoiding wastes production. Three levels focusing on economic activities production level of individual enterprise, intergrowth level of many enterprises and social consumption level, formed three important ideas of material circle economy and made the recycling economy take great improvement in theory and practice.

Traditional industrialization is one-way linear economy is a material recycled circle process of resource-product-recyclable resource-reproducible products. Recycling economy is a great shot and improvement to traditional industrial economic development mode. The real principle of recycling economy is to reduce, reuse and recycle, that is the so-called "3R"principle. Recycling economy provided traditional industrialization changing to sustainable

economy with strategic theory mode and solved the sharp contradictory between environment and development in a fundamental way and made a win-win game between economy and environment. Recycling economy has succeeded in many developed countries from minimize emission in enterprises to the exchange of wastes among enterprises in a regional industrial ecological system and then to the recycling of material and energy in and after products consumption such as the Dupont individual enterprise recycling economy in the level of enterprises. In 1980s DuPont combined "3R"production method in order to reduce emission or realize non-emission. In regional level, there is the ecological industrial region mode, which faces the intergrowth enterprises. The ecological industrial region in Denmark focuses on electricity factory, oil refinery, pharmaceutical factory and gypsum factory. It takes wastes or byproducts of other enterprises through trade as its own production material, sets up industrial alliances like "paper-pulp-paper making", "fertilizer-cement", "steelmaking-fertilizer-cement " through the intergrowth and super session among enterprises and in the end realizes "nonpollution" and "non-emission". In social level there is a double system mode of Germany focusing on emission after consumption. Its DSD is a nongovernmental organization focusing on recycling of covery wastes. It receives tryst of enterprises, recycles and classifies the wastes then takes them to the recycling factory, and wastes, which can be reused, will be sent to the manufacturer.

In order to foster the development of recycling economy, countries like Germany and Japan make relative laws, as "dealing ways of covery wastes" in 1991 and "recycling economy and dealing ways of wastes " in 1996 in Germany and "basic laws fostering building a recycling society", "promoting laws in utilizing resource effectively", "laws in reuse of electricity", "laws in reuse of food", "purchasing law of environment protected food", "laws in reuse of construction" and "laws in reuse of holders" in Japan. Its goal is to build a recycling society.

China has entered the trial process of recycling economy. Liaoning province and Guiyang city of Guizhou province were made trial province of developing recycling economy by National Environment Protection Bureau. Driven by National Environment Protection Bureau, the construction of ecological industrial region is in the ascendant like Guigang Guangxi National ecological industrial region (in sugar refining), Nanhai Guangdong National ecological industrial region ,Baotou city, an important city of Inner Mongolia National ecological industrial region (in aluminum production), Shihezi National ecological industrial region (in papermaking).

Developing recycling economy is the right choice of practicing modern industrialization

According to the prediction by a study team on sustainable development of Chinese Academy of Science, the overall trend of environment worsening in China will still last for about 50 years. That is to say, we cannot stop this trend and go on a healthy development way until 2050. Today out emission of industrial wastes is still in a high level especially in some areas, it is far above the bearing capacity of environment. Take Baotou city, an old industrial base, heavy chemical industrial city for example. In 2002, the total consumption of coal in Baotou city was 12,000,000 tons, up 820,000 tons over 2001, among which, the industrial consumption covers over 82% of the total, up 830,000 tons over 2001. The total emission of industrial waste gas was 80,000,000 tons. Industrial solid wastes were 12,000,000 tons, among which, slag, waste residue coal ash cover over 90% while utilization rate was less 15%. The waste residue factory formed in these years covers an area of 21 km^2, about 1/6 of the constructed area of the city. When old factories accelerate to expand, new important projects are built in Baotou city such as 1,000,000-ton aluminum factory, 10,000,000 KW electricity power, 200,000-400,000 tons copper, 830,000 tons methanol, and 300,000 tons acetic acid. During the introduction of there new and large projects, advanced production technology was

taken but if there is no rational distribution and effective utilization of wastes, they must be great pressure to the environment bearing capacity of the city. And the question of city bearing capacity forces many countries in China like Baotou City to take large-scale measures to change their economic developing mode.

Developing recycling economy is the right and typical reflection of modern industrialization and also a strategic decision. It not only can solve the problem of resource and environment, reach the goal of " low resource cost, low environment pollution ", but also can improve enterprises' operation, offer job opportunities, and reach the goal of " good economic benefit", and "full use of human resource". Meanwhile, developing recycling economy requires and fosters technology improvement. It also meets the requirement of high technology intensiveness. Therefore, modern industrialization requires recycling economy and developing recycling economy is the requirement and certain choice.

PUSHING ON THE DEVELOPMENT OF ECOLOGICAL INDUSTRY, BUILDING UP RECYCLING ECONOMY MODE

Ecological industry is the basic way to develop recycling economy

The manufacturing process of enterprises is independent in traditional industry, which is the important reason of pollution and high resource consumption. Ecological industry emphasizes the material circle process of industry system of which an important way is to build intergrowth among different industries and manufacturing process according to the mode of natural ecological system. Through the intergrowth and inter-sharing among different enterprises or manufacturing process, we can find decomposition for wastes, build the food chain or food net for industrial ecological system and control the pollution during the process manufacturing. This can make regional manufacturing process clean, minimize wastes and maximize the utilization of resource and reach the goal

of changing pollution negative effectiveness into resource positive effectiveness.

Because the recycling of wastes can bring about economic benefit and make pollution controlling a conscious behavior driven by economic benefit, pushing on building ecological industry system will foster the change of economic developing mode and become the recycling economy developing mode. The most idea thought of developing ecological industry is the coupling of industrial ecological system and natural ecological system, which is a complex systematic project, and provincial government should play an important role in it. First, they should propose in a high voice, set up a typical example, keep close touch with the advancement of international recycling, release relative information to the public in time and build a media environment that is beneficial to the ecological and recycling economy development. Second, they should make a plan in developing local ecological industry especially the development plan for ecological industry region, help the region build a high-effective management system and design the industry distribution according to the adjustment of economic structure and the requirement of recycling economy. Third is to pursue technology innovation, organize technology working team and continually develop recycling economy technology in order to meet the need of ecological industry. Fourth is to lead consuming and market behaviors beneficial to ecological industry and recycling economy, so to set up recycling management system in policy-making, regulate and limit those behaviors that do not meet the requirement of recycling economy.

Ideas on developing ecological industry and building recycling economy in Baotou city

High cost, high energy consumption and high pollution are the main features and limitation factors in Baotou city, which is an old industrial city dominated by traditional industry. Building

ecological industry can really combine economy with pollution prevention and environment protection so to realize the win-win game, which is the inevitable choice for regional economy to carry on healthy development. Guided by theory of ecological industry, combined with resource and industry advantage in Baotou city and with industry structure, the catenation and combination among enterprises and industries, and the building of ecological industrial system, which is relative to each other, fosters and develops together, can fully develop Baotou city's resource and industry advantage, realize coordinated growth between environment and economy and accelerate economic construction. Developing ecological industry must be reflected through certain way, which is the carrier-ecological industrial exemplary area. First we should set up a good example and make the Baotou city national ecological industrial exemplary area a innovation example of practice. It is designed according to the principle of cross coupling, vertical close, regional integration, soft structure and function-orientation. It has three functional areas-core area, broadening area and radiation area; and it also has 5 ecological chain and two production systems-electrical power and aluminum. In the electrical power system, there are several industrial systems like carbon, electrolytic aluminum and so on. Cross coupling relationship will be formed between the two systems through electricity and waste water so that a stable ecological industrial netcentred with combination of aluminum and transforming in Donghe district, we take measures of withdrawing from the second industry and enter new industry and in the end realize the coordinated growth of economy, society and environment there.

It's the certain requirement to make a general plan, carry it out step by step and develop ecological industry in the area of the whole city. First we should have a general plan. In distribution, (1) building the "rebuild able ecological industry" in a high starting point in the south rural part like copper industry or natural gas chemicals; (2) building the "remaking ecological industry "in

traditional steel industry, electrical power industry and machinery manufacturing; (3) building the "fictitious ecological industry" in other areas. This kind of distribution has a starting point of "west Yellow River industrial corridor", will be centered by the Baotou Steel & Iron Company and stench its several industrial chains to southwest and northwest. For example, we can combine the waste gas from Baotou Steel & Iron Company with the natural gas introduced to the city and develop it into natural gas chemicals; the waste residue can be used as the raw material of cement; construction material made of coal ash can be combined with rare earth to make complex deoxidation material; the scatter of steam from the blast furnace can be used to produce lysine forage to further develop milk cow feeding…On conclusion, the east, west, south and north of the city should be built into an ecological industrial region, and city industry and suburban industry should be put into the distribution of recycling economy.

CONCLUSION

It is a systematic project to develop recycling economy among which the ecological enterprises are the mini-recycling; the ecological industrial region is the midre cycling and ecological city is the big recycling. The ultimate object of the co-development of city construction and ecological industry is to build an ecological city. The building of ecological city includes infrastructures, traditional and modern industries, eco system, ecological agriculture, electricity power, environment-friendly consuming and ecological housing. Therefore, on the basis of building Baotou into a national park city, we should develop this construction together with ecological industry, and according to the requirement of recycling economy; we should integrate measures like clean production, ecological industry and ecological agriculture to make them a systematic strategy. Through the inner material recycling among subsidiary systems, we can finally set up recycling economic operation system with high effective utilization of energy, full sharing of information, the

adjustment of city space distribution and rearrangement of economic regional structure in the whole city.

REFERENCE

Graedel. T. E., Allenby B. R. 1995. Idustrial Ecology, Prentice Hall, New Jersey.

Hovarongkura, D. Lowe, E. 1997. Zero Pollution for Industry: Waste Minimization Through Industrial Complexes. Journal of Cleaner Production, 5(1-2):131-132.

Lowe, E. A. Evans, L. K. 1996. Industrial ecology and industrial ecosystems. Fuel and Energy Abstracts, 37(1):58.

Lowe, Edgar F; Keenan, Lawrence W. 1997. Managing phosphorus-based, cultural eutrophication in wetlands: a conceptual approach. Ecological Engineering, 9(1-2):109-118.

Lowe, Ernest A; Evans, Laurence K. 1995. Industrial ecology and industrial ecosystems. Journal of Cleaner Production, 3(1-2):47-53.

Lambert, A. J. D.Boons, F. A. 2002. Eco-industrial parks: stimulating sustainable development in mixed industrial parks. Technovation, 22 (8): 471-484.

Zhang, sifeng and ZhangYing (2002), Comments on the Study of Recycling Economy in China. Journal of Xi'an Transportation University, 9:25-29.

Yuan, jiongliang (2003), Recycling Economy & Aluminum Ecological System. Nonferrous Metal, 3(3): 27-30.

Zhang, Jing (2003), Modern Industrial Mode & Sustainable Development of Economy and Society in China. Economy Crisscross, 3: 22-25.

Xu, shufan (2001), Push on the Development of Ecological industry and Set up Recycling Economy Mode. China Environment Protection Industry, 12:22-23.

Management Review: An International Journal Volume 2 Number 2 Winter 2007

Nurturing The Entrepreneurial Spirit—Developing Teachers' Economic Knowledge And Entrepreneurial Dispositions

Kimberly P. Code,
Northern Kentucky University
Highland Heights, Kentucky 41099, USA
E-MAIL: codek@nku.edu

ABSTRACT

The No Child Left Behind legislation has created an increased focus on K-12 curriculum standards, pedagogy, and teacher knowledge. On component of this shift is an increased focus on personal finance, economic, and entrepreneurial education initiatives. Entrepreneurial education is increasingly more important not only in our economy but also in our educational system. Despite this focus, the perceptions of the classroom teacher—the agents most responsible for the delivery of the entrepreneurial curriculum—have been largely overlooked. For example, how do teachers perceive the role and importance of entrepreneurs? What are the perceptions of teachers with regards to their ability to find adequate curriculum materials? How do teachers feel about their ability to deliver entrepreneurial education? Finally, how do these perceptions change when teachers are exposed to formal entrepreneurial education opportunities? This research examines teacher perceptions of entrepreneurs and entrepreneurship education in the context of the statewide Entrepreneurs in Kentucky pilot program. During that period, over 400 teachers were given formal entrepreneurial education training in workshops around the state, and over 5,000 students were exposed to one or more parts of the program.

Pre- and post-test evaluations of teachers attending these workshops indicate (1) that teacher's perceptions of entrepreneurs were favorable to begin with; (2) that professional development opportunities for teachers significantly improved already positive attitudes toward entrepreneurship and knowledge of economic and entrepreneurial content; and, (3) that teacher's confidence in their ability to deliver entrepreneurial education increased as a result of participating in these professional training opportunities.

INTRODUCTION

One of the key engines of growth in our economic is entrepreneurship (Consortium, 2006). The twenty-first century has been referred to as the "Entrepreneurial Age" with entrepreneurship having "a greater impact on the future economic growth of the United States than any other event in our nation's history" (Sexton and Kasarda, 1992). Economists have even integrated the entrepreneur as the "fourth" factor of production, along with land, capital, and labor (Slavin, 2002; Childress et. al., 1998). As a result, entrepreneurial education is receiving increasing attention at the K-12 levels. The Consortium for Entrepreneurship Education recently released national content standards for entrepreneurship education at the k-12 level as well as addressing the needs of adult learners (Consortium, 2006).

The Kentucky Council on Economic Education is included in this growing national trend with its innovative and comprehensive *Entrepreneurs in Kentucky* program, a Leavey Award winning entrepreneurial curriculum designed for elementary, middle, and high school students in the state of Kentucky. The philosophy behind the *Entrepreneurs in Kentucky* curriculum was to teach about economics, entrepreneurs, and entrepreneurship by studying entrepreneurs who

lived and worked in Kentucky. The core of each curriculum was based on ten lessons dealing with various aspects of entrepreneurial activity. Each lesson included an introduction, a section that helped teachers prepare for the lesson, several interactive teaching activities tied to the lesson, and a section that described ways to "connect" with the community—such as with the use of other curricula, teacher resources, and related web sites. Reproducible black-line activity sheets keyed to the activities were also available for each lesson.

In order to enhance the effectiveness of the program, classroom teachers were exposed to brief professional development sessions to familiarize them with the importance of entrepreneurs and the availability of entrepreneurial materials for their classrooms. As part of the training sessions, many of the teachers were both pre- and post-tested in order to evaluate their perceptions of entrepreneurs and entrepreneurship education. These test instruments form the basis for this study, which examines the effects of the professional development sessions on the teachers' knowledge of specific economic and entrepreneurial concepts, as well as perceptions and attitudes towards entrepreneurs and entrepreneurship education.

ENTREPRENEURIAL EDUCATION IN THE LITERATURE

Entrepreneurial education has received growing attention in the literature. As for content, Gustafson defined entrepreneurship education as "an ideal context for students to address perennial questions concerning their identity, objectives, hopes, relation to society, and the tension between thought and action. Entrepreneurship concerns thinking of what we are as persons. Its consideration raises issues at the core of the liberal arts tradition" (Gustafson, 1993). Meanwhile, Kourilsky argues that entrepreneurship education is composed of three major themes: "the

demand for entrepreneurship education, education access to the 'Make-a-Job' option and economic growth through job creation" (Kourilsky, 1995). Individuals who are exposed to entrepreneurship concepts have "more opportunity to exercise creative freedoms, higher self-esteem, and an overall greater sense of control over their own lives" (Consortium, 2006).

Initial attempts at entrepreneurial education focused on the job creation theme. The national Junior Achievement program that brought business executives and students together in an attempt to start a student business typifies this approach (Francomano and Lavatt, 1988). A study by the Gallup Organization and the National Center for Research in Economic Education study endorsed this and similar efforts when it found that high school students, the general public, and small business owners and managers thought that schools should increase their emphasis on entrepreneurship and starting a business. However, only twenty-five percent of the high school students surveyed indicated that they had taken a course in business or entrepreneurship in high school. Sixty-nine percent of these students did indicate an interest in starting their own business (Gallup, 1994).

Later, entrepreneurial education shifted its focus to an understanding of the entrepreneur's role in the broader context of the overall economic system. The National Council on Economic Education's entrepreneurial curriculum materials *Choices and Changes—You Can Be an Inventor: Human Capital and Entrepreneurship*, along with *Economics, Entrepreneurship, Teaching Strategies*, and Entre*preneurship in the U.S. Economy* typify efforts in this regard (NCEE). Likewise, leading high-school economics textbooks now include a substantial treatment on the importance of the entrepreneur (Clayton, 2005, Miller, 2005).

Despite these developments, subsequent studies on economic literacy show that many still do not understand the role and importance of the entrepreneur in our economy. Louis Harris & Associates, Inc. conducted *The Standards in Economics Survey* on behalf of the National Council on Economic Education. The survey was designed to evaluate adult and student understanding of knowledge about the U.S. economy, familiarity with basic economic principles, and the importance of entrepreneurship. The results of the study indicated that students and adults lacked a basic understanding of the core economic concepts of scarcity of resources, money, and inflation, with less than half demonstrating knowledge of these terms. Three out of four American adults, compared with three out of five high school students, were aware that a person who starts a business to produce a new product in the marketplace is an entrepreneur. One in four students did not know whether someone who starts a business to produce a new product in the marketplace is a manager, a bureaucrat, or an entrepreneur (Louis Harris & Associates, Inc., 1999).

The rate of progress in economic and entrepreneurial literacy may in part be due to the delivery mechanism. A study dealing specifically with entrepreneurial education indicates that a focus on entrepreneurial awareness in a participatory environment has a positive impact. Specifically, a study by Ball and Beasley determined that participation in entrepreneurship awareness education created a higher awareness of entrepreneurship for both students and teachers. In addition, teachers and students who participated in entrepreneurship awareness education had a “sense of truly enjoying being involved in the program” (Ball and Beasley, 1998).

Other studies have shown that economic education and an understanding of basic entrepreneurial concepts can be made an effective part of the teacher training process: Sosin, Dick, and Riser

found that elementary school teachers who were enrolled in a graduate course that required them to teach economics to elementary level students were more likely to include economics as part of their curriculum. "Students' understanding of economics concepts will increase if teachers and economic educators work together in a concerted, sustained effort" (Sosin, Dick, and Reiser, 1997). The implication from this line of research is that economic and entrepreneurial education can be greatly enhanced by directly involving teachers in the process—as opposed to simply providing curriculum materials for them.

Other studies have lent support to this contention. For example, a recent study by Pierce found that students of teachers who participated in teacher training workshops had significant gains in their understanding of economics. As a result, in-service workshops are an effective method for preparing teachers to teach economics in their classrooms (Pierce, 1982). Even other studies have also supported the belief that teacher in-service training and university courses in economic education have significant effects on teacher knowledge as well as student cognitive learning (Schober, 1982; Hungerford, 1985).

The influences of teacher professional development and university-based courses on implementation of economic education in the K-12 classroom have also been examined. Specifically, Sosin et. al. found that the "continuing support from instructors and sharing of experiences from the classroom help the teachers to find successful instructional strategies, reduce their stress over making changes in their teaching, and generate enthusiasm for teaching economics" (Sosin, Dick, and Reiser, 1997). The overall thrust of these studies indicates that the collaboration between classroom teachers, university

personnel, and members of the business community enhances student learning and bodes well for the future of entrepreneurial education.

The *Entrepreneurs in Kentucky* program was developed in this collaborative tradition—with teachers, university personnel and members of the business community working collectively to implement an effective entrepreneurial education program. As a result, there was every expectation that teachers would respond to the shared experiences, and that students would benefit by having a richer understanding of the importance of the entrepreneur in our economy. The evaluation phase of the curriculum effort, and the focus of this paper, was intended to determine the success of the program, especially with respect to the attitudes and perceptions of teachers, which is a fundamental ingredient to a successful entrepreneurial education program.

THE 'ENTREPRENEURS IN KENTUCKY' CURRICULUM

The *Entrepreneurs in Kentucky* program began as a result of indicated need for curriculum in the area of economics and entrepreneurship. As part of the Kentucky Education Reform Act of 1990, the Kentucky Department of Education instituted global learning goals and in 1998, the Kentucky *Program of Studies* was developed to guide the curriculum being taught in Kentucky schools. The *Program of Studies for Kentucky Schools Grades Primary-12* provides a basis for establishing and/or revising curriculum. It also outlines the minimum content required for all students before graduating from Kentucky high schools. These curricular regulations require all students to receive instruction in the content area of economics. Knowledge of economic and entrepreneurial concepts was included to aid students in making better career and consumer choices. This knowledge is also

viewed as a means to provide student understanding of how investment in human capital can be of benefit to them.

The *Entrepreneurs in Kentucky* curriculum was available at three levels—elementary, middle, and high school—so that a variety of students could be exposed to the material. The lessons were also written so that they would be consistent with Kentucky's Learning Goals and Academic Expectations, the National Council on Economic Education's Voluntary National Standards in Economics, and so that they could be taught in an interdisciplinary manner. Each curriculum manual also contains an appendix with profiles of Kentucky entrepreneurs, a video developed by Kentucky Education Television (KET) with 21 entrepreneurial segments, and a pre- and post-test for student assessment purposes.

Professional Development Training: The curriculum was disseminated to teachers throughout the state through enrollment in a graduate distance-learning course and/or attendance at a three-hour professional development workshop. The workshops were scheduled by a professional development coordinator who worked in collaboration with school districts and administrative personnel to determine the school districts' curriculum needs. If a needs assessment indicated a need in the area of entrepreneurship, a workshop was scheduled for a particular school district or area where teachers from several districts were able to participate.

Following the scheduling, registration, and promotion of the workshop, the actual workshop was based on a hands-on, interactive philosophy. The teachers were provided with a meal of some type, a hardcopy of the curriculum, and then introduced to particular demonstration lessons. The workshops typically had an introductory session with all teachers before they were separated into grade level groupings. In

each of the groups, elementary, middle, and high school, the teachers were provided with demonstrations of at least one lesson from their particular grade level. The various components of the curriculum were also discussed, and at least one video—for example, the "Sanders Museum and Café" which deals with the beginnings of Kentucky Fried Chicken under Colonel Harlan Sanders—was shown. Participants were provided with hands-on activities in which they were exposed not only to the terminology, but also given an opportunity for application of the concept or idea.

The Survey Population: The key participants in this study were teachers from throughout the state of Kentucky representing high school, middle school, and intermediate teaching grade levels. Their teaching area was most often in a social studies related area, however forty-three percent indicated that their primary teaching area was outside of the social studies discipline.

The participants had varying degrees of economic preparation with nineteen percent having no formal preparation, fifteen percent taking weekend or evening economic education workshops, seven percent had taken summer workshops in economic education, fourteen percent had a three hour college principles of economic class, and thirty-one percent had more than three college credit hours of economics classes. The teachers also had an average of five to ten years of teaching experience with an education level of at least a bachelor's degree, and thirty percent having a master's degree.

Regardless of previous economic knowledge, all teachers received training from either the three-hour professional development workshop strand of the program, or the graduate-level distance learning course. The teachers were given a questionnaire before they participated in the training portion of the program; the teachers

subsequently completed the questionnaire again in a post-test format when the training was completed.

The Evaluation Instrument: The data used in the study were derived from the evaluation instrument distributed to teacher participants. The instrument had a section for demographic information, ten bi-polar adjective questions regarding attitude towards entrepreneurs, entrepreneurship, teaching and curriculum materials, as well as ten multiple-choice questions assessing teacher knowledge of economic content.

Questions number one through ten were designed using a bi-polar adjective format which is a variant of the semantic differential test design. Questions number one through five addressed teacher attitude towards entrepreneurs and entrepreneurship; questions six through ten focus on teaching and curriculum materials. Questions eleven through twenty were multiple-choice questions addressing the fundamental economic concepts contained in the curriculum which are based on economic education content standards developed by the National Council on Economic Education. The questions also represented the three cognitive areas of knowledge, comprehension, and application from Bloom's taxonomy (Bloom, 1956).

ANALYSIS OF RESULTS

One hundred fifty-four pre-training questionnaires and one hundred forty-four post-training questionnaires were collected, scored, and entered into a spreadsheet for analysis. Because the pre- and post-test sample sizes varied, the t-test statistic was computed using a pooled estimate of population standard deviation. The following t-statistic which compensates for uneven samples was used to test the hypothesis about two means:

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - (u_1 - u_2)}{s^* \sqrt{\frac{1}{n_1} - \frac{1}{n_2}}}, \quad \text{where } s^* = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}},$$

where X-bar is the pre/post-test mean, u_1 is the pretest population mean, u_2 is the post-test population mean, s_1 is the pretest variance, s_2 is the post-test variance, n_1 is the pretest population size, and n_2 is the post-test population size. The n for the pre-and post tests were different as some teachers would arrive too late to take the pre-test, while other would leave before the post-test could be completed. This test was used to test the hypothesis that there was no significant difference between the pre- and post-training means for each question on the instrument. The results of the statistical analysis are shown in Tables 1, 2, and 3—with eighteen of the questions showing improved results that were significant at the 99% significance level (See Table 1).

The results for the first five questions, shown in Table 1, focused on teacher perceptions of entrepreneurs and entrepreneurship. The responses to question one were very favorable initially—so much so that significant improvement may have been difficult to achieve. Even so, the mean score improved, although the improvement was not statistically significant. Questions number two through five, however, showed improvements that were significant at the 99% level. Specifically, question two dealt with the teachers' perceptions of their own entrepreneurial ability, while question three dealt with perceptions of entrepreneurial activity in their state. Question four dealt with perceptions of the availability of entrepreneurial opportunities the state, and question number five dealt with the

teachers' ability to provide examples of entrepreneurship in the state (See Table 2).

The second set of questions, shown in Table 2, analyzed teachers' perceptions of entrepreneurship teaching and curriculum materials. Overall, the t-test statistic indicated that—as a result of the professional development training—teachers felt significantly more confident about their ability to deliver entrepreneurial education. Specifically, the scores on questions six, seven, and eight indicate that teachers felt much more confident about the availability, and of their efforts to find, entrepreneurship education materials. The results for questions nine and ten showed that teachers felt more qualified to teach a curriculum on entrepreneurs, and that they looked forward to teaching a unit on entrepreneurial ability. The scores for each of the five questions in this section were found to have improvements that were statistically significant at the 99% level (See Table 3).

The final portion of the analysis, shown in Table 3, indicated that teachers scored significantly higher on nine of the ten questions related to economic and entrepreneurial content. These questions were different from the first ten in that they were in a multiple-choice format to better assess the teacher's knowledge of various economic concepts. As a result, the scores for each of the questions reflect the percent of respondents that got the question correct during both the pre- and post-tests. To illustrate, 96.6% of the respondents correctly identified entrepreneurs as being "risk-takers who are in business in order to make a profit" (see question 11). While this is a remarkably high percentage, all of the respondents got the question correct on the post-test, which reflects an improvement significant at the 99% significance level.

The scores for all but one of the content questions in Table 3 showed significant improvements at the 99% level. Question number fourteen focused on the concept of the proprietorship as the form of business organization that poses the most risk to the owner. The results indicate that this topic possibly was not clearly explained, did not have enough emphasis in the training, or that the question was poorly specified in the first place. The content assessed included concepts such as the forms of business organization (proprietorship, partnership, and corporation), a general description of the entrepreneur and the entrepreneurial work environment, the role of the profit motive, the nature of productive resources, the role of the entrepreneur in the community, primary motivations of the entrepreneur, characteristics of the market economy, and the effect of the forces of supply and demand. In general, the topics in questions 11-20 were most closely associated with the *Entrepreneurs in Kentucky* curriculum, Kentucky's Learning Goals and Academic Expectations, and the National Council on Economic Education's *Voluntary National Standards*. The fact that the improvements were so significant for all but one of the questions indicates that teachers did, in fact, improve their knowledge of key economic and entrepreneurial concepts.

CONCLUSION

The purpose of this study was to analyze the impact of the teacher professional development component of the *Entrepreneurs in Kentucky* curriculum program. The results of the analysis indicate that the program had significant beneficial effects on teacher participants' perceptions of the entrepreneur and his or her role in the economy as evidenced by improved scores on nine of the first ten questions, which were significant at the 99 percent level. The results also show that teachers improved their understanding of key economic and

entrepreneurial concepts—with improved scores on nine of the last ten content questions that were also significant at the 99 percent level.

Overall, this research indicates that teachers who participated in the *Entrepreneurs in Kentucky* training program had more confidence in their own entrepreneurial abilities; were more knowledgeable with regard to the availability of quality curriculum materials; were more confident of their ability to find these materials; and had increased positive attitudes about their own qualifications with regard to teaching an entrepreneurial curriculum. These results are both consistent with, and extend the current findings of, the entrepreneurial education literature.

The entrepreneur is a vital component in our economy, and entrepreneurship education is playing an increasingly important part of national and state curriculum guidelines (Consortium, 2006). The results of the study support the strong interest in, and need for, professional teacher development workshops in economic and entrepreneurial education. The improvement in positive attitudes found in this study bode well for the long-term success of the *Entrepreneurs in Kentucky* curriculum program in particular, and entrepreneurial education in general.

REFERENCES

Ball, Rebecca W. & Fred Beasley. (1998). Entrepreneurship awareness education: An example in an elementary school. *Journal of Small Business Strategy*. 9: 26-38.

Bloom, Benjamin. (1956). *Taxonomy of educational objectives: The classification of educational goals, handbook 1: Cognitive* domain. McKay Publishing: New York.

Childress, Michael T., Michael Smith-Mello, and Peter Schirmer. (1998). *Entrepreneurs and small Business—Kentucky's neglected natural resource.* The Kentucky Long-Term Policy Research Center: Frankfort, Kentucky.

Clayton, Gary E. (2005). *Economics: Principles and practices*. Glencoe Publishing: Columbus, Ohio.

Consortium for Entrepreneurship Education. (2006). National content standards for entrepreneurship education. http://www.entre-ed.org. Retrieved: September 12, 2006

Francomano, J., W. Lavitt, & D. Lavitt. (1998). Junior Achievement: A history. Junior Achievement, Colorado Springs, CO.

Gallup Organization, Inc. & National Center for Research in Economic Education. (1994). *Entrepreneurship and small business in the United States: A survey report on the views of the general public, high school students, and small business owners and managers.* Ewing Marion Kauffman Center for Entrepreneurial Leadership, Inc.

Gustafson, J. (1993). *Seeing is not only about business*. *Pulse*[2], November: 25-26.

Hungerford, Larry Lee. (1985). Some factors that may influence the teaching of economics by North Carolina high school social studies teachers. *UMI ProQuest Digital Dissertations*. (AAT 8523651).

Kourilsky, Marilyn. (1995). *Entrepreneurship education: Opportunity in search of curriculum*. *Business Education Forum*.

Louis Harris & Associates, Inc. (1999). *Results From the standards in economics survey*. The National Council on Economic Education EconomicsAmerica [On-line]. Available: http://www.nationalcouncil.org/poll/results.html.

Miller, Roger Leroy. (2005). *Economics: Today and tomorrow*. Glencoe Publishing: Columbus, Ohio.

National Council on Economic Education. (1997). *Choices and changes EII—You can be an inventor: Human capital and entrepreneurship*. National Council on Economic Education. New York.

National Council on Economic Education. (1997). *Economics and entrepreneurship, teaching strategies*. National Council on Economic Education. New York.

National Council on Economic Education. (1997). *Entrepreneurship in the U.S. economy*. National Council on Economic Education. New York.

National Council on Economic Education. (1997). *Voluntary national content standards in economics*. National Council on Economic Education. New York.

Pierce, Randal Harry. (1982). An Assessment of an in-service workshop's effectiveness in preparing teachers to use an integrated instructional approach for economic education. *UMI ProQuest Digital Dissertations*. (AAT 8300324).

Schober, Howard Michael. (1982). An examination of the effects of inservice training on selected aspects of economic education. *UMI ProQuest Digital Dissertations*. (AAT 8301607).

Sexton, D.L. & J.L. Kasarda (Eds.). (1992). *The state of the art of entrepreneurship*. Boston, MA: PWS-Kent.

Slavin, Stephen L. (2002). *Economics*. Sixth Edition. Irwin: Chicago.

Sosin, Kim, James Dick, and Mary Lynn Reiser. (1997). *Determinants of achievement of economics concepts by elementary school students*. *The Journal of Economic Education* 28: 100-121.

Kimberly P. Code, Ph.D. (codek@nku.edu) is an assistant professor of education at Northern Kentucky University. She teaches foundations and gifted and talented courses. Her research interests are entrepreneurial and economic education and education for gifted and

talented students. She recently developed the www.GiftedSources.com web-portal for gifted and talented students of all ages.

Table 1
Teacher Attitudes Toward Entrepreneurs and Entrepreneurship Questions 1-5

Question	Mean Score Pre/ Post-Training
1. I would describe my attitude towards entrepreneurs as being _____. VERY FAVORABLE 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 VERY UNFAVORABLE	pre: 1.97 post: 1.94
2. I consider myself to have _____ entrepreneurial ability. A GREAT DEAL OF 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 VERY LITTLE	pre: 4.00 post: 3.23**
3. When it comes to *current* entrepreneurial activity in the state, Kentucky is _____ other states. WAY BEHIND 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 WAY AHEAD OF	pre: 3.93 post: 4.83**
4. I believe that there are currently a(n) _____ number of entrepreneurial opportunities in Kentucky. ENORMOUS 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 LIMITED	pre: 3.13 post: 2.25**
5. Right now I could supply _____ examples of entrepreneurship in Kentucky. VERY FEW 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 NUMEROUS	pre: 3.43 post: 5.58**

**=99% significance level

Table 2
Entrepreneurial and Economic Teaching and Curriculum Materials Questions 6-10

Question	Mean Score Pre/ Post-Training
6. To the best of my knowledge, quality curriculum materials for public school entrepreneurial curriculums are _____ . READILY AVAILABLE 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 DIFFICULT TO FIND	pre: 4.86 post: 2.99**
7. I am _____ with internet or web site locations regarding entrepreneurship. UNFAMILIAR 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 VERY FAMILIAR	pre: 2.31 post: 4.50**
8. At the current time, I feel _____ my ability to find quality curriculum materials on entrepreneurship. CONFIDENT OF 1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7 GENERALLY UNCOMFORTABLE WITH	pre: 4.73 post: 2.92**
9. I feel that I am currently _____ to teach a curriculum on entrepreneurs. HIGHLY QUALIFIED 1 -- 2 -- 3 -- 4 -- 5 -- 6 -- 7 GENERALLY UNQUALIFIED	pre: 5.13 post: 3.09**
10. Given my current training, I _____ teaching a unit(s) on entrepreneurial ability. DREAD 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 LOOK FORWARD TO	pre: 4.68 post: 5.78**

**=99% significance level

Table 3
Knowledge of Economic and Entrepreneurial Content Questions 11-20

Question	Mean Score Pre/Post-Training
11. Which of the following best describes an entrepreneur?	pre: 96.6 post: 100.0**
12. The entrepreneur receives ___ as the reward for his/her activities.	pre: 88.0 post: 97.6**
13. The three main forms of business organization are ___.	pre: 60.5 post: 71.8**
14. The form of business organization that poses the most risk to the entrepreneur is the ___.	*pre: 41.3* *post: 40.0*
15. The entrepreneur can be thought of as ___.	pre: 50.7 post: 65.9**
16. The entrepreneur typically ___.	pre: 94.6 post: 97.6**
17. Entrepreneurs are found most often in ___.	pre: 95.3 post: 96.5**
18. Someone who organizes and combines factors of production in hope of earning a profit is a(n) ___.	pre: 81.2 post: 94.1**
19. In a market economy prices for goods and services are established and regulated by ___.	pre: 91.3 post: 96.5**
20. The motivation that drives entrepreneurial activity is ___.	pre: 85.2 post: 90.6**

(**=99% significance level)*

Teacher Survey

Directions: For each of the questions below, pick a numerical response, or a letter answer, that best fits the question.

I. Entrepreneurs and Entrepreneurship:

1. I would describe my attitude towards entrepreneurs as being _____ .

   VERY FAVORABLE 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 VERY UNFAVORABLE

2. I consider myself to have _____ entrepreneurial ability.

   A GREAT DEAL OF 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 VERY LITTLE

3. When it comes to *current* entrepreneurial activity in the state, Kentucky is _____ other states.

   WAY BEHIND 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 WAY AHEAD OF

4. I believe that there are currently a(n) _____ number of entrepreneurial opportunities in Kentucky.

   ENORMOUS 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 LIMITED

5. Right now I could supply _____ examples of entrepreneurship in Kentucky.

   VERY FEW 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 NUMEROUS

II. Teaching and Curriculum Materials:

6. To the best of my knowledge, quality curriculum materials for public school entrepreneurial curriculums are _____ .

   READILY AVAILABLE 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 DIFFICULT TO FIND

7. I am _____ with internet or web site locations regarding entrepreneurship.

   UNFAMILIAR 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 VERY FAMILIAR

8. At the current time, I feel _____ my ability to find quality curriculum materials on entrepreneurship.

   CONFIDENT OF 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 GENERALLY UNCOMFORTABLE WITH

9. I feel that I am currently _____ to teach a curriculum on entrepreneurs.

   HIGHLY QUALIFIED 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 GENERALLY UNQUALIFIED

10. Given my current training, I _____ teaching a unit(s) on entrepreneurial ability.

    DREAD 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7 LOOK FORWARD TO

III. Economic Concepts:

11. Which of the following statements best describes the entrepreneur?
    a) Entrepreneurs normally work for large businesses.
    b) Entrepreneurs are professional "white collar" workers who typically earn large salaries.
    c) Entrepreneurs are risk-takers who are in business in order to make a profit.
    d) Entrepreneurs make huge profits in the stock market and by lending money to others.

12. The entrepreneur receives _____ as the reward for his or her productive activities. a) salary b) profits c) wages d) interest and dividends

13. The three main forms of business organization are the _____, _____, and _____.
    a) corporation, franchise, partnership
    b) franchise, partnership, proprietorship
    c) partnership, entrepreneurship, corporation
    d) corporation, partnership, proprietorship

14. The form of business organization that poses the *most* risk to the owner is the
    a) proprietorship.
    b) corporation.
    c) cooperative.
    d) entrepreneurship.

15. The entrepreneur can be thought of as
    a) one of the factors of production that includes natural, human, and capital resources.
    b) a form of business organization.
    c) a type of "middleman" who makes money by buying and selling.
    d) a person in our economy with one of the best jobs or occupations.

16. The entrepreneur typically
    a) works in a comfortable, air conditioned environment.
    b) works relatively short workweeks and has a great deal of spare time.
    c) works long hours, which often leaves little time for recreation and other activities.
    d) works outdoors in activities such as forestry and agriculture.

17. Entrepreneurs are found most often in
    a) service industries like banking, education, and tourism.
    b) industries with large manufacturing plants and facilities.
    c) natural resource industries like ranching and mining.
    d) all industries, regardless of size or the product produced.

18. Someone who organizes and combines factors of production like natural resources, human resources, and capital resources in hopes of earning a profit is a(n): a) capitalist. b) industrialist. c) optimist. d) entrepreneur.

19. In a market economy such as that in the United States today, prices for goods and services are established and regulated by a) the government. b) the forces of supply and demand. c) entrepreneurs. d) large corporations.

20. The motivation that drives entrepreneurial activity is a) the social responsibility that is required to be a better citizen. b) the prestige and recognition that comes from being an entrepreneur. c) self-interest and the hopes of earning a profit. d) the desire to have a prestigious, comfortable, and well-paid job.

IV. Demographic Information—Check the box that best describes your situation.

1. Current Teaching Grade Level: [ ] High School
[ ] Middle School
[ ] Intermediate
[ ] Other, please describe: _____

2. Current School System/District and School:
(Example: Campbell County, etc.)
_____

3. Primary Teaching Area, Current:

[ ] Social Studies
[ ] History
[ ] Political Science
[ ] Business Studies or related
[ ] Other, please describe: _____

4. Formal Economics Preparation:

[ ] None
[ ] Weekend or evening Economic Education workshop(s)
[ ] 2-5 week summer workshop in Economic Education
[ ] 3 hour college "Principles of Economics" class
[ ] More than 3 college credit hours of economics classes
[ ] Other, please describe: _____

5. Full-time Teaching Experience:

[ ] less than one full year
[ ] 1-4 years
[ ] 5-10 years
[ ] 11-20 years
[ ] 21 years and over
[ ] Other, please describe_____

6. Business/Economics Classes *[ ] Standard "Principles of Economics" course*

Previously Taught:

[ ] Consumer economics
[ ] Accounting or bookkeeping
[ ] Typing, office equipment
[ ] Other, please describe:

_____

7. Educational Level:

[ ] Bachelor's degree in:

_____

[ ] Master's degree in:

_____

[ ] Rank I
[ ] Rank II
[ ] Ed.D.
[ ] Other, please describe:

_____

8. Gender:

[ ] Male
[ ] Female

Management Review: An International Journal Volume 2 Number 2 Winter 2007

Games, Clickers and Study Habits: Increasing Students' Motivation to Study and Participate

Sherry Robinson
Penn State University
Hazleton PA, USA
Email: skr12@psu.edu

ABSTRACT

Students of the Net Generation have grown up being entertained and educated through fast-paced media that can make traditional lectures seem dull. One way of using technology to make classes more engaging is the use of electronic response devices or "clickers." This study examines students' perceptions of games and clickers based on their self-reported study habits. It is determined that even some students who "never" study their notes before class would study for a game, while the majority of students, regardless of study habits, would be more likely to participate if clickers were used.

Keywords: Electronic Response Devices, Learning Games, Active Learning

INTRODUCTION

The Net Generation, also called Millenials, typically includes the population born in the 1980s or later. Having grown up in a fast-paced environment with TV game shows, interactive video games and the internet, they were taught, as well as entertained, through the use of technology. As a result, they respond best to learning environments that are social, active and learner-centered (Prensky, 2001; Ramaley and Zia, 2005). Preferring hands-on, experiential

activities instead of lectures, they are simply bored by what is usually offered to them as education (Oblinger and Hawkins, 2005; Prensky, 2001).

Learning games, particularly those that utilize clickers, provide a more effective method to teach Net Generation students because they create an interactive learning experience in which students are active players who know immediately how well they are doing (Cruickshank and Telfer, 1980; Prensky, 2001; Sugar and Takacs, 1999). In addition, these engaging activities may also better serve the needs of students whose learning styles are not well served by the traditional lecture format (Baker, Simon, and Bazeli, 1986).

Building on previous research regarding the in-class use of games and clickers, this study analyzes students' motivation to study to be better prepared to play a learning game, their willingness to participate when using clickers, and their normal study habits. The results show that students who study "sometimes" or "always" are more likely to study for a game, but even some students who "never" study their notes before class report that they would study for a game. The majority of students, regardless of study habits, reported that they would be more likely to participate in class if clickers were used. The following section reviews the literature on learning games and clickers, with the methodology and results of this study then presented.

LEARNING GAMES

Learning theories generally point out the need for immediate feedback and student involvement (Hequet, 1995; Foreman, 2003). Games create an interactive learning experience by creating learning episodes in which the learners are active participants, and can reinforce critical information while avoiding rote practice (Doyle, 2001; Rotter, 2004; Sugar and Takacs, 1999). By making learning fun, negative anxiety, especially pertaining to an upcoming test, can

be turned into more positively-charged excitement (Blake and Goodman, 1999; Revere, 2004). Play (fun) can even activate different parts of the brain and help improve learning (Bekoff and Byers, 1998). On a daily basis, games played at the beginning of class can diagnostically show faculty what students already know, while games played at the end of class indicate how well students understood the material presented that day (Blake & Goodman, 1999).

One popular game that has been adapted for classroom use, especially reviewing material for tests, is Jeopardy. A form of this game has been successfully used by many instructors in a variety of courses, especially those in the physical sciences (e.g. Azriel et al., 2005; Benek-Rivera and Mathews, 2004; Revere, 2004; Yolanda and Banbury, 2004). In Revere's (2004, p. 5) study, students reported that playing Jeopardy increased their test preparedness which then "contributed to a positive exam experience." After determining that playing Jeopardy was as effective as lecture-based review, Azriel and associates (2005) concluded that learning games may be very useful for making students happy while still satisfying other stakeholders such as parents, potential employers, and society. Like Jeopardy, a version of Who Wants to Be a Millionaire?, Wheel of Fortune, and Tic-Tac-Toe have also been shown to be useful in motivating students to study and become more engaged in class (Blake and Goodman, 1999; Cook and Hazelwood, 2002; Yolanda and Banbury, 2004). One explanation for this increased student interest is that people are intrinsically motivated to invest effort in activities they enjoy, and that games that allow for social interaction are not only fun, but also allow students to learn from each other (Jenkins, 2005). Health of a population is a complex and poorly understood issue, and that increasing access to health care may not be an effective way to improve health (Laaksonen, et al., 2005).

One issue with learning games is that they can result in apparent confusion and an increased noise level (Cruickshank and Telfer, 1980). Indeed it seems to be "the nature of the beast" that the noise level in a class rises as students interact with teammates and compete with each other during the game. An important factor in minimizing noise is minimizing "down time." Students are more likely to engage in private conversations during the times in which they are not actively involved in answering a question or otherwise participating in the game. Therefore, the key to reducing noise is decreasing the time during which only one or a few students are involved in answering a question. The use of clickers is one way to allow all students to actively participate more often and reduce down time.

CLICKERS

Clickers, the common name for electronic response systems, are small electronic remote control-type devices approximately the size of a half deck of playing cards. In response to questions shown through presentation software such as PowerPoint, students press buttons on the clickers, sending signals to a receiver, which tabulates and graphically displays the results. Although clickers are not always used to play games per se, the activity of using the clickers is often perceived as fun.

Anonymity is one feature of the clicker system that may help to increase participation. Students' answers are displayed in an aggregated form, providing privacy for respondents. This encourages shy or self-conscious students to participate, especially when discussing personal or controversial issues (Chickering and Ehrmann, 1996; Davis, 2003; Draper and Brown, 2004). Whereas verbal responses or raising hands in large classes can be problematic, clickers can be used by all students to register their individual decisions or opinions (Shapiro, 1997).

However, the use of technology to make class more engaging is not whole-heartedly embraced by everyone because of frustrations with the technology or general objections to the increased use of technology in classes (Hatch, Jensen and Moore, 2005; Okan, 2003). Carlson (2005, p. 37) quoted a Millenial student who stated that "technology is a 'hook' for people who aren't going to study anyway." The question of which students benefit most is a valid one. To explore this issue further, this study analyzes students' responses to clickers and learning games based on their self-reported study habits. In the following section, the methodology of this study is presented, followed by the results and analysis.

METHODS

Based on the concept that Net Generation students would appreciate greater interactivity, review games that involved the use of clickers were created. The clickers were also used when new material was presented and opinion-based questions were asked during the lecture. Students indicated their answers by choosing from a multiple-choice list, and pressing the appropriate keys on the clickers. The entire class could then see the proportion of the class that chose each answer. For fact-based activities, students chose what they believed to be the correct answer. After viewing the class' responses, students discussed the question with a friend, consistent with Mazur's (1997) peer tutoring, and then voted again. Review games such as Jeopardy were also played, using the system's "first responder" capability that indicated the first team to "buzz in" to answer a question.

Some schools that use clickers require that students purchase clickers and bring them to each class. Naturally, the failure of students to bring the clickers to class can be a significant problem (Draper and Brown, 2004; Hatch, et al., 2005). To eliminate this problem, the students in this study used university-owned clickers that were distributed at the beginning of each class in which the

devices were used. The clickers were collected at the end of class and properly maintained with new batteries as needed.

Students in seven sections of business classes (management, accounting, economics) at a small campus of a large public university in the northeast United States were included in this study. Respondents, mostly of traditional college age, were freshmen through seniors. Although some students were in more than one class, their responses were included only once. Of the 120 unique respondents surveyed, 49 (41%) were women. The survey itself was conducted through the use of the clickers or paper surveys. Student comments were also collected through a secure online site.

RESULTS AND ANALYSIS

Students were asked to indicate how often they reviewed their notes before class, how motivated they would be to study for an in-class game, and whether they would participate more in class if clickers were used. After the data were collected, two answer categories to the notes review question were collapsed, with"1-5 times per semester" and "Couple of times per month" merged into "Sometimes", and "Once per week" and 'Every class" merged into "Always" (see Table 1). Students were also asked how often they read their textbooks, but responses were virtually the same. Therefore, only the question regarding notes was used for this study.

The responses to the "motivated to study for a game", and "participate more with clickers" questions (see Table 2) were then analyzed by sex and study habit. This was done in order to determine if students reporting different degrees of studying (especially those who "never" study for class) would be more motivated to study or participate. The results of ANOVA and chi-square analyses are shown in Tables 3, 4 and 5. Although the analyses were conducted on raw data, the percentages shown for the chi-square analyses are the proportions of each sex indicating

each answer.

Table 1 Response Table by Frequency of Notes Review

Study Frequency	Total	Women	Men
Never	29	14	15
1-5 times per semester	34	15	19
Couple of times per month	21	5	16
Merged category “Sometimes”	55	20	35
Once per week	31	13	18
Every class	5	2	3
Merged category “Always”	36	15	21
Total	120	49	71

Table 2 Questions Regarding Motivation to Study and Participate

Would you become motivated to study to play a review game?	Would you be more likely to participate in a class opinion survey if you could use the clickers to do the poll, rather than raising your hand?
1 - No, not at all	1 – No, I always participate fully regardless
2 - Somewhat	2 – No, I won’t participate unless I have to
3 – Yes	3 – Probably yes
	4 – Absolutely yes

Table 3 Frequency of Notes Review

Frequency of notes review	Total	Women	Men
Never	1.62	1.43	1.80
Sometimes	2.12	1.75	2.34
Always	2.32	2.40	2.24
ANOVA F	8.834	9.899	.050
Sig.	.000	.000	.050

ANOVA shows that overall and within the sexes the means are significantly different between the various groups based on study habits. Not surprisingly, those who study their notes tend to be the most motivated to study for a game. However, even some of those who stated that they never study for class would be at least a little motivated to study for a game, as indicated by the mean (Table 3) that is greater than 1 (No, not at all). Women who never study had the lowest mean for studying for a game, while those who always study had the highest mean. With men, however, those who study sometimes had the highest mean for studying for a game. In fact, men who never study had a higher mean than women who sometimes study.

Table 4 Responses Regarding Motivation to Study for a Game Based on Frequency of Notes Review

Frequency of Notes Review	Total	Women	Men
Never			
Motivate to Study			
Somewhat	44.8%	57.1%	33.3%
No, not at all	38.3%	42.9%	53.3%
Yes	6.9%	0%	13.3%
Chi-square 2.947 sig. .229			
Sometimes			
Motivated to Study			
No, not at all	20.0%	35.0%	11.4%
Somewhat	47.3%	55.0%	42.9%
Yes	32.7%	10.0%	45.7%
Chi-square 8.893 sig. .012			
Always			
Motivated to Study			
No, not at all	13.9%	6.7%	19.0%
Somewhat	41.7%	46.7%	38.1%
Yes	44.4%	46.7%	42.9%
Chi-square 1.129 sig. .563			

To gain a better understanding of which groups would be more motivated to study, chi-square analyses were performed. Analysis of the results shows there is an association between sex and motivation only among those who sometimes study. As suggested by the means, men in the "sometimes" group would be more motivated to study for a game. Only 11.4% of the men who sometimes study would *not* be motivated to study for a game, compared to 35% of women in that category. In contrast, 45.7% of men, but only 10% of women, who sometimes study would definitely be motivated. Women who never study appear to be the least motivated to study for a game, as 57.1% stated they would not be motivated and none reported that they definitely would be.

Table 5 Responses Regarding Increased Participation with Clickers Based on Frequency of Notes Review

Frequency of Notes Review	Total	Women	Men
Never			
Increased Participation			
No, already participate fully	6.9%	0%	13.3%
No, won't participate unless forced	6.9%	14.3%	0%
Probably yes	48.3%	64.3%	33.3%
Absolutely yes	37.9%	21.4%	53.3%
Chi-square 7.390 sig. 060			
Sometimes			
Increased Participation			
No, already participate fully	10.9%	5.0%	14.3%
No, won't participate unless forced	9.1%	10.0%	8.6%
Probably yes	41.8%	35.0%	45.7%
Absolutely yes	38.2%	50.0%	31.4%
Chi-square 2.534 sig. .469			
Always			
Increased Participation			
No, already participate fully	11.1%	20.0%	4.8%
No, won't participate unless forced	16.7%	13.3%	19.0%
Probably yes	30.6%	20.0%	38.1%
Absolutely yes	41.7%	46.7%	38.1%
Chi-square 3.092 sig. .378			

Almost 43% of women and 67% of men who never study would be at somewhat motivated, to study for a game. These could be considered positive results given this group's normally poor study habits.

Among those who already study frequently, 86.1% (93.4% of women and 81.0% of men) would be at least somewhat motivated to study for a game. This proportion drops to 80.0% (65.0% for women and 88.6% for men) among those who sometimes study, and 45.2% (42.9% for women and 66.6% for men) among those who never study. These findings are not surprising as it seems reasonable that those who already study frequently would be the most likely to become motivated to study more.

In regard to increased participation, the majority of students indicated that they would probably or absolutely be more likely to participate in class when clickers are used. It is important and encouraging to note that the highest percentage of people who would participate more is found amongst those who never study (86.2% overall, 85.7% among women and 86.6% among men), with those who sometimes study having a similar percentages (80.0% overall, 85.0% among women and 77.1% among men). Among those who always study, 72.3% (66.7% among women and 76.2% among men) are likely to participate more if clickers are used. Therefore, the lowest increase in participation would be expected among those who study the most, but even in this group, almost three-quarters of the students would participate more.

Interestingly, the highest proportions of students who state that they won't participate unless forced are found in the category of "always" study. Whereas 19.0% of men who always study are in the "forced" category, none of those who never study stated that they would refuse to participate. The percentages for women were similar for those who never (14.3%), sometimes (10.0%) and always (13.3%) study. The greatest range for the response "I already

participate fully" was found among women as 0% of those who never study stated that, while 20% of those who always study said they participate fully.

Chi-square analysis showed no statistically significant association between sex and study habits in regard to participation. In order to conduct ANOVA on the data from this question, those who reported that they already participate fully were temporarily eliminated, leaving an ordinal scale. However, no significant differences were found. Overall, these results clearly indicate that the use of clickers would be likely to increase participation among most of the students, even those who never study.

CONCLUSION

This study supports the findings of other educators who have successfully implemented learning games (e.g. Azriel et al., 2005; Benek-Rivera and Mathews, 2004; Revere, 2004). These results show that games can also motivate many students--even those who do not normally study for class--to study for games. While other teaching methods may also provide focused review, the advantage of learning games is that they allow students to become actively involved with the content. Games also provide both the instructor and student with an assessment tool whereby they can immediately determine areas of weakness (need for greater study or emphasis).

Millennial students are highly motivated by competition, even when the only prize is the glory of being proclaimed winners. The competition level that is involved in some types of learning games, such as Jeopardy, stimulates an interest that may not be achievable with other teaching methods, especially among men, who tend to enjoy competitive activities. This competition may be linked to another important factor to students--fun. Together, these factors could lead to the motivation to study for a review game. It is significant that approximately half of the students who never

review their notes--potentially the most difficult students to motivate--would be at least somewhat motivated to study for a game and participate in class. However, the greatest gains are likely to be seen among those who sometimes study, and are motivated to study more with the encouragement of a game.

Students who have grown up being entertained present particular challenges to teachers. This study has shown that clickers can be used to create a more learner-friendly environment for Millennials. If students accurately reported their future behaviors, participation should increase with the use of clickers in the classroom. It was expected that those who never study would also be the least likely to participate (unless forced). On the contrary, those who always study were more likely to refuse to participate. One limitation of this study is that it does not take different learning styles into account. Some students may learn better by reviewing notes they have taken while sitting quietly in class, while others may benefit more from socially participating in class rather than reviewing notes individually. However, it is just because of differences in learning styles that various methods should be used in class in order to reach out to all students.
Future research should continue to investigate the use of games and clickers, especially in regard to related changes in student behaviors.

REFERENCES

Azriel, J. A., M. J. Erthal and E. Starr. (2005). 'Answers, Questions, and Deceptions: What is the Role of Games in Business Education?' *Journal of Education for Business*, 81(1): 9-13.

Baker, R.E., Simon, J. R., and Bazeli, F. P. (1986). 'An Assessment of Learning Style Preferences of Accounting Majors.' *Issues In Accounting Education*, 1: 1-12.

Bekoff, M. and Byers, J. (1998). *Animal play*. Cambridge University Press.

Benek-Rivera, J. and V. E. Mathews. (2004). 'Active learning with Jeopardy: students ask the questions,' *Journal of Management Education*, 28(1):104-118.

Blake, J. and Goodman, J. (1999). 'Computer-based Learning: Games as an Instructional Strategy.' *ABNF Journal,* 10: 43-46.

Carlson, S. (2005). 'The Net Generation Goes to College.' *The Chronicle of Higher Education,* 52: A34-A37.

Chickering, A. and Ehrmann, S. C. (1995). 'Implementing the Seven Principles: Technology as Lever.' *AAHE Bulletin,* October: 3-6.

Cook, E. D., and Hazelwood, A. C. (2002). 'An Active Learning Strategy for the Classroom--"Who Wants to Win…Some Mini Chips Ahoy?' *Journal of Accounting Education*, 20: 297-306.

Cruickshank, D. R. and Telfer, R. (1980). 'Classroom Games and Simulations,' *Theory into Practice,* 19: 75-80.

Davis, S. (2003). 'Observations in Classrooms Using a Network of Handheld Devices,' *Journal of Computer Assisted Learning*, 19: 298-307.

Doyle, E. (2001). 'Games 101.' *Training & Development*, 55: 16-17.

Draper, S. W. and Brown, M. I. (2004). 'Increasing Interactvity in Lectures Using an Electronic Voting System,' *Journal of Computer Assisted Learning,* 20: 81-94.

El-Rady, J. (2006). 'To Click or Not to Click: That's the question,' *Innovate*,2(4). http://www.innovateonline.info/index.php?view=article&id=171 Retrieved April 3, 2006.

Forman, D. C. (2003). 'Eleven Common-sense Learning Principles,' *Training & Development*, 57: 39-46.

Hatch, J., Jensen, M., and Moore, R. (2005). Manna from Heaven or "Clickers" from Hell. *Journal of College Science Teaching,* 34: 36-39.

Hequet, M. (1995). 'Games that Teach,' *Training*, 32 (7): 53-58.
Jenkins, H. (2005). 'Getting into the Game,' *Educational Leadership*, 62: 48-51.
Mazur, E. (1997). Peer instruction: A user's manual. Prentice Hall.
Oblinger, D. G. and Hawkins, B. L. (2005). 'The Myth About Students,' *Educause Review,* September/October:12-13.
Okan, Z. (2003). Edutainment: Is learning at Risk? *British Journal of Educational Technology*, 34: 255-264.
Prensky, M. (2001). 'Digital Natives, Digital Immigrants, Part II: Do They Really *Think D*ifferently?' *On the Horizon,* 9.
Ramaley, J. & Zia, L. (2005). 'The Real Versus the Possible: Closing the Gap in Engagement and Learning,' In D. Oblinger and J. Oblinger (Ed.), *Educating the Net Generation.* Retrieved December 10, 2005 from http://www.educause.edu/TheRealVersusthePossible%3AClosingtheGapsinEngagementandLearning/6064
Revere, L. (2004). 'Classroom Jeopardy: A Winning Approach for Improving Student Assessment, Performance, and Satisfaction,' *Decision Line*, 23(3): 4-6.
Rotter, K. (2004). Modifying "Jeopardy" Games to Benefit All Students,' *Teaching Exceptional Children,* 36(3): 58-62.
Shapiro, J. A. (1997). 'Electronic Student Response Found Feasible in Large Science Lecture Hall,' *Journal of College Science Teaching,* 26: 408-412.
Sugar, S., and Takacs, G. (1999). Games That Teach Teams: Tale of the RAT. *The Journal for Quality and Participation*, 22: 54-5
Yolanda, S. and Banbury, C. (2004). Active Learning Facilitated by Using a Game-show Format or Who Doesn't Want to Be a Millionaire? *Journal of Management Education*, 28: 509-518.

Management Review: An International Journal

Editorial Policy

Management Review: An International Journal (MRIJ) publishes intellectual findings to academies and practitioners in profit and non-profit organizations as well as local and global institutions on all aspects of managerial issues. MRIJ promotes the findings of sharing knowledge, exchanging experience and creating new ideas between academes and practitioners. MRIJ encourages all manuscripts of multi-disciplinary and cross-functional approaches with theoretical and empirical, technical and non-technical, and cases studies related to managerial issues in certain individual organizations, societies, countries. The journal is a double-blind referred journal.

Manuscript Submission

Your manuscript should be original contents that are not copyrighted, published, accepted for publication by any other journal, or being reviewed to any other journal while being reviewed by the Journal. Your manuscripts should be formatted with Century 12 points, double-spaced, left-aligned, 2.5 inches of top, 1.5 left and right, and 2 bottom margins on international standard (letter) size. The manuscript size may be between seven and fifteen pages. Manuscripts should follow generally accepted manuscripts printing guidelines. All manuscripts should be electronically submitted to the managing editor at kinforms@kinforms.org.

Management Review:
An International Journal

Management Review: An International Journal
Volume 2, Number 2, December 30, 2007
ISSN: 1975-8480

www.kinforms.org
Email: kinforms@kinforms.org