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An Empirical Study into the Effect of an Individual's Learning Style on End-User Computer Satisfaction (EUCS): Taiwan

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ABSTRACT

This study investigate the impact an individual's learning style, as moderated by age and gender, can influence his or her satisfaction with computer applications. We surveyed end users located in twenty multinational firms based in Taiwan. Three hundred forty one usable surveys were obtained. The results suggest that individuals with different learning styles rank the five constructs of end user computer satisfaction (EUCS) differently. Our results also suggest that the variables gender and age do moderate the relationship between learning style and end user computer satisfaction.

INTRODUCTION

Organizations are investing large amounts in information technology. It is not unusual for organizations to invest 3-5 percent of its annual revenue on information technology (Hoffer, 2002). Several studies have identified increased computer literacy and capability as a critical factor if this technology is to be used productively in the work place. Multimillion dollar systems go unused or underutilized largely because employees do not have the skills or inclination to use these computer-based systems effectively. In an effort to achieve greater utilization and higher levels of worker productivity, organizations are spending heavily on training. Approximately one-third of all formal training in the United States is devoted to teaching employees about computers (Chou et al., 2000). In fact, according to International Data Corporation (IDC.com), spending on worldwide information technology (IT) education and training will reach $28.6 billion annually by 2006. Over the same period, it is estimated that the U.S. technology training market will increase at a 13.3% annual rate, reaching $18.3 billion.

One factor that has been suggested to increase system usage is to increase the employee's satisfaction with this technology. Higher end user satisfaction has been found to increase an individual's utilization of various computer-based systems, thus, supporting organizational objectives to use information technology to achieve its strategic objectives. Several studies have been completed that support this statement (Amoroso and Cheney, 1991; Buyukkurt and Vass, 1993; Davis and Davis, 1990; Hackathorn, 1988; Harrison and Rainer, 1992). For example, a study by Simon found that higher levels of end user satisfaction not only led to greater system usage, but also resulted in increased levels of productivity amongst computer users (Simon, 2000).

The growing use of and organizational dependence on end-user computing has motivated both researchers and practitioners to search for new and/or better ways of training end users. Recent studies have found that successfully matching learning style, information type, and training/learning technique can lead to higher levels of end user computer satisfaction (EUCS), which in turn can lead to higher levels of computer use and productivity (Simon, 2000). Based on these findings, it follows that information systems (IS) researchers have identified computer training as a critical factor for ensuring the successful use of computer technologies and its applications (Cheney et al., 1986; Gururajan et al., 2002).

This study will examine the effect different learning styles can have on end-user computing satisfaction (EUCS), and how individual differences, (age and gender) moderate this relationship. This paper first reviews the literature on end user computing satisfaction and learning styles, followed by a discussion of the moderators investigated in this study – age and gender. After establishing the constructs and methodology of the study, the statistical findings will be presented. The paper is concluded with a discussion of the findings, recommendations and calls for future research.

LITERATURE REVIEW

End User Computer Satisfaction

End user satisfaction is defined as "the effective attitude towards a specific computer application by someone who interacts with the application directly" [13; p. 261]. This suggests that end user satisfaction can serve as an important proxy when evaluating the success or failure of computer-based systems. A growing body of research has emerged which examines factors associated with the successful usage of information technologies in the workplace (Bostrom et al.,1990). Many of these studies have found that user satisfaction impacts the individual's quality of work life, overall usage of the system, and ultimately, the goals of the organization. Other studies have suggested that higher levels of end user satisfaction result in increased usage of information technologies which in turn improve decision-making and end user productivity in the organization. These studies have also typically identified end user training as one of the key factors in ensuring the success of end user computing (Sein et al., 1999).

There have been several studies which have investigated end user computing satisfaction (Cyert and March, 1963; Montazemi, 1988; Nath, 1989; Igbaria and Nachman, 1990; Buyukkurt and Vass, 1993). Cyert and March (1963) originated the concept of user satisfaction

suggesting that an IS that meets the needs of the users will reinforce satisfaction with that system and that user satisfaction itself can be used as a surrogate measure of system effectiveness.

Ives and Olson (1984) suggested that user involvement relates to user satisfaction and ultimately contributes to IS success. Baroudi, Olson, and Ives (1986) also fount that user involvement can lead to increased system usage. They demonstrated that user involvement in the development of IS will enhance both system usage and user's satisfaction with the system. Similarly, Doll and Torkzadeh (1988) suggested that user involvement is one of the key factors affecting user satisfaction and improving decision-making. From these arguments, use and user satisfaction seem to be causally related.

Montazemi (1988) identified factors that affected end user satisfaction in the small business environment. His study found several relationships that positively impacted end-user satisfaction. These factors included end user participation, computer literacy, and levels of end user training provided. Another study, done by Buyukkurt and Vass (1993), investigated factors that contributed to satisfaction with the end-user computing process. The factors they found to be significant were quality of technical support, quality of end user output, timeliness, application characteristics, perceived effect on career, familiarity and experience with computer based information systems. Several other studies have supported the idea of providing end user computing support / training as a means to ensure end user satisfaction (Amoroso and Cheney, 1991; Miriani and King, 1994; Rivard, 1987).

Igbaria and Nachman (1990) found that the leadership style of information systems managers was positively and significantly related to end user satisfaction. They found that there was a significant positive relationship between end user satisfaction and hardware and software accessibility and availability, the computer background of users, users' attitudes toward end user computing, and system utilization. Interestingly, Igbaria and Nachman (1990) also found computer anxiety and user age were negatively related to end user satisfaction. Nath (1989), in contrast to Igbaria and Nachman (1990), found that frequency of use was positively related to end users satisfaction for upper level managers. Nath (1989) also found that for lower level managers the amount of time spent using computers correlates negatively with their satisfaction level.

According to DeLone and McLean's model (1992) of IS success, information quality and system quality can be linked to user satisfaction. They identify ease of use and usefulness of system features as two key indicators of system quality. They also found user satisfaction to be considered as one of the important factors contributing to IS success (DeLone and McLean 1992). Doll and Torkzadeh (1989) initiated that, especially in the context of end-user computing, satisfaction or end-user computing satisfaction is an appropriate surrogate measure for information system success.

Doll and Torkzadeh (1988) developed an instrument to measure end-user satisfaction. The instrument was developed to measure the satisfaction of users who directly interact with the computers for a specific application. Based on an extensive review of literature, and interviews with a diverse group of end users, they developed a 40 item instrument that utilized a five point Likert type scale. A pilot study of 96 end users from five firms was conducted to validate the instrument. The result of the pilot study was an instrument with 18 items. The modified instrument was then sent to 44 firms for further validation. Six hundred eighteen usable responses were received. After performing reliability and validity tests, they dropped another 6 items from the instrument; the final instrument utilized 12 items to measure five first order constructs (content, accuracy, format, ease of use, and timeliness) and one second order construct which provided an overall measure of user satisfaction.

Doll and Torkzadeh's (1988) end user satisfaction instrument has been used in many studies to measure individual's satisfaction with computer systems. It has received extensive empirical support through validations, applications and replications (Al-Gahtani and King, 2000; Chen, Soliman, Mao and Frolick, 2000; Dol, Xia, and Torkzedah, 1994; Hendrickson, Glorfeld and Cronan, 1994; Kim and McHaney, 2000; McHaney, Hightower and Pearson, 2002; McKinney, Yoon and Zahedi, 2002). This study is based primarily on Doll and Torkzadeh's user satisfaction work. As such, our questionnaires/constructs on end user satisfaction are taken directly from Doll and Torkzadeh's work.

Learning Style Inventory

Learning styles plays an integral role in understanding a trainees' ability to assimilate computer-based technology and as a predictor in training program effectiveness. The understanding of how individual learning styles can impact computer usage and acceptance can contribute to the more effective utilization of IT training budgets. If an individual's learning style can be identified, then a training program could be designed to match that individual's style. This understanding and tailoring has the potential to reduce the cost and time required for training and result in more effective transfer of knowledge, leading to a worker who is more productive and more satisfied in the work place.

In 1984 & 1985, Kolb developed the Learning Style Inventory (LSI), which identified four learning types according to how learners perceive and process information. Kolb suggested that learning is a four-stage cycle starting with concrete experience, which forms the basis for observation and reflection upon experiences (Loo, 1999). These observations are assimilated into concepts and generalizations about experiences which, in turn, guide new experiences and interactions with the world. The LSI breaks this learning process into four quadrants which represent the four basic learning styles. These are diverger, assimilator, converger, and accommodator (See Figure 1).

Assimilators

Assimilators perceive information abstractly and process it reflectively. They are rational thinkers and learn by watching and thinking about they have observed. They focus on the soundness of ideas rather than on practical application, therefore, they sometimes are overly cautious and impractical (Kolb 1984 & 1985). An individual with assimilator style tends to rely on intuition rather than logic. They would like to apply his or her own learning in real life situations (ibid).

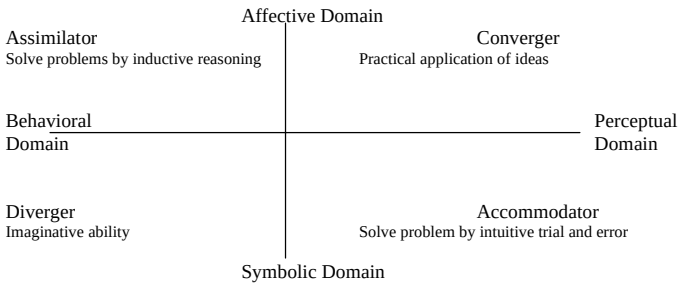
Convergers

Convergers perceive reality through abstract conceptualization and process it through active experimentation. They are "common sense" learners who value practicality, productivity, and efficiency. They cut through to the bottom line and thrive on timeliness.They tend to be impersonal and prefer working with things rather than people. However, they may act before they have sufficient data or without considering important aspects of a situation.

Accommodators

Accommodators perceive reality through concrete experiences and process it through active experimentation. They excel in problem solving, trying new experiences, taking risks, adapting information to new situations, using intuition and adapting to change. They are called accommodators because they adapt well to new circumstances and to applying knowledge in new ways. However, they tend to overlook theory when it conflicts with their own experience or their view of the facts. Therefore, they may have impractical plans and typically do not complete work on time.

Figure 1: Four Quadrants of LSI



Divergers

Divergers perceive information concretely and process it reflectively. They learn by concrete information given them their senses and by watching. They are imaginative and often have broad interests. However, they can be stymied by too many alternatives and become indecisive (ibid.).

While Kolb (1985) defined two dimensions and four stages of learning, some research studies actually have found that one dimension was more significant than the other (Chou et al. 1999, Chou et al. 2000). When trying to validate Kolb's LSI and LSI-1985, Loo (1999) failed to find support for the original LSI and LSI-1985. However, an exploratory factor analysis using the four style scores supported the two bipolar dimensions developed by Kolb (Loo, 1999).

Recent studies relating to the two dimensions of learning style have found that, computer usage, e.g., Web page design, had a significant impact on learning performance and computer attitude (Chou et al., 1999). According to Chou et al. (1999), participants with active experimentation (AE) style would be more confident and less anxious toward computers than those with reflective observation (RO); Participants with abstract conceptualization (AC) style would be more confident and less anxious toward computers than those with concrete experience (CE).

Chou et al. (2000) also tested a hypothesis that there would be no significant difference in learning performance among the different learning styles. It was partially rejected. They further inferred that their converger subjects performed the best and divergers had the lowest scores in tasks which measured general and procedural knowledge (Chou et al. 2000). Those tasks were graded on the degrees of correctness and problem solving skills.

Sein et al. (1991), in another study on learning styles, concluded that task performance measured by the accuracy was affected by learning style. Converger subjects who combine active experimentation (AE) and abstract conceptualization (AC) performed the best, followed by diverger, assimilators and accommodators the worst. In their study, the results also indicated that performance could be enhanced by tailoring instructional methods to accommodate individual differences in learning style. Converger using the analogical model had the lowest accuracy; accommodator using abstract model had worse performance than providing by analogical model (Sein et al., 1991),

The study of Wang et al. (2001) was based on the combined data collected during two eight-week classes on "Internet Strategy" for business. They studied the potential of computer-supported collaborative learning (CSCL) for learners with different learning style, and found no differences in learning outcomes and learner satisfaction with different learning style. However, Wang et al. indicated that the nature of CSCL environments might enable similar satisfaction and success for learners with different learning styles. Future research with large samples would be needed to validate this statement.

Moderators: Age and Gender

To further understand the relations between CL and EUCS, this research will use age and gender as moderating variables and examine the interactions between independent and dependent variables. A moderator variable affects the direction or changes the relationship between independent and dependent variables.

In Kolb's (1984) research, there was an indication that persons become more reflective over a lifetime and younger persons tend to have a greater preference for active learning experiences. Dirkx et al. (1992) conducted a study in which participants from young and older adult groups were asked to recall abstract and concrete words. Their results showed that both groups were able to recall more concrete words than abstract words. However, younger adults performed better in imagery, whereas older adults were superior in an organization context.

In the paper reported the effects of a training program designed to acquaint managers with computer technology for assisting making, Ford et al. (1994) found that older adults had an increase in spreadsheet usage, quantitative techniques, MIS planning and personal participation in MIS planning in relation to decision support training in comparison with younger adults (under 40). However, responses of the above five questions, the authors found no differences after decision support training between male and female (Ford et al., 1994).

Harrison et al. (1992) found that gender and age were associated with computer skills. They provided the evidences that females exhibited significantly lower skill levels than males; age however, demonstrated a significant relationship with computer skill (Harrison et al., 1992). In the study by Chou et al. (2000), gender and learning style played in interacting with training method. Gender, in their study, was proposed as a moderating variable that would moderate the effects of training method on learning performance and computer self-efficacy (Chou et al., 2000). Male students benefited more from the instruction-based and female students learned better in the behavior modeling condition for performance (ibid.). However, they didn't find any difference in learning style between male and female's performances.

The study of e-mail uses in explaining TAM (Technology Acceptance Model) model, Gefen et al. (1997) found that women and men differ in their perceptions but not use of e-mail. In their study, women has higher perceived of social presence of e-mail, perceived of usefulness, and perceived of ease of use of e-mail, however, they didn't have the higher uses of e-mail (Gefen et al., 1997). The authors further suggested that impact of culture on IT diffusion should be pursued in future research (ibid.).

Research Model

Based upon the literature review provided above, we would suggest the following model (See Figure 2) as the foundation of this study.

It is believed that individuals with different learning styles will value the first-order constructs of EUCS differently. This relationship will be moderated by factors such as age and gender. We therefore, put forth the following research questions.

1. Do individuals with different learning styles value the 1st order constructs of EUCS differently?
2. Would gender, as moderating variable, moderate the relationship between learning styles and the 1st order constructs of EUCS?
3. Would age, as moderating variable, moderate the relationship between learning styles and the 1st order constructs of EUCS?

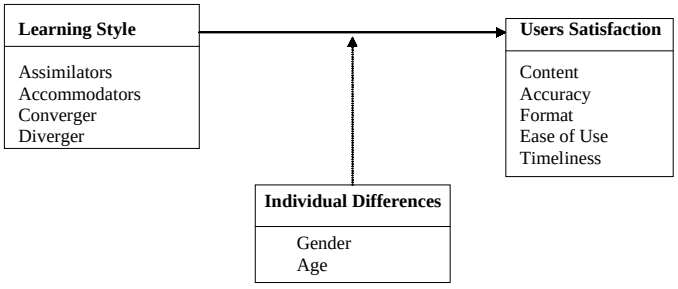
RESEARCH METHOD

Three parts compose this section; first we stated the characteristics of research method, followed by the description of the studied sample, then the sample group demographics.

Subjects

The target population for this study was knowledge workers - specifically, individuals whose primary work involved the use of computer technology in their daily work activities. Representatives from twenty companies were identified and asked to participate in this study. The companies were large, multi-national organizations that represented a diverse group of industries including agriculture, oil refining, insurance, retail, consulting, transportation, and finance. Each representative was asked to distribute 20 questionnaires to a randomly selected group of knowledge workers throughout their organization. Individuals were identified for participation based on their job description and a short interview to determine the extent to which they utilized computer technology in their daily activities.

Figure 2: Research Model



Instrument

The survey package contained a cover letter from the organization's representative, a letter from the researchers explaining the purpose of the study, and the questionnaire. All respondents were guaranteed confidentiality of their responses. This study utilized four sections of a multipart questionnaire - ten questions were included to solicit information about the respondent and their organization; eight questions to determine the extent of computer usage; twelve questions designed to measure the individual's dominant learning style; and finally, twelve question to measure the respondent's satisfaction with their computer systems. As a follow-up, after two weeks the company representatives contacted those individuals who had not completed the survey instrument. A total of 341 individuals completed the survey instrument for a response rate of 85 percent (341/400).

RESULTS

Demographics

A total of 341 subjects voluntarily participated in this study. Of the 341 respondents, 178 (52.2%) are males, and 163 (47.2%) are females. Fifty-nine percent were college graduates with fifty-four percent citing business as their primary educational background. Seventy-one percent of the respondents were employed in a functional area other than information systems. Sixty-eight percent of the participants were either middle management, first line management or professionals. The mean age was 29, and with a range of 17 to 52 years old. Over seventy percent of the respondents had some experience with computers. The majority of subjects use computers (97.1%) at work, while sixty-seven percent of the total sample own one or more computers at home. Of those home computer owners, seventy-eight percent of them use computer more than once a week at home. Obviously, the use of computers is an integral part of their jobs. In fact, ninety-two percent of the respondents reported that the use of a computer was required at their jobs. Therefore, the participants of this study were predominantly knowledge workers.

RESULTS

Of 248 respondents, there are 60 respondents in the Assimilator quadrant, 61 respondents in Converger quadrants, 61 respondents in Accommodator quadrant, and 58 respondents in Diverger quadrant.

Research Question #1: Learning Styles and its relationship to the 1st order constructs of EUCS.

To answer the first research question, we conducted an analysis of variance (ANOVA) for four quadrants of learning styles in five 1st order constructs of EUCS. The results showed that two subconstructs – Accuracy ($F = 5.64$, $p < 0.001$) and Timeliness ($F = 3.80$, $p<0.01$), varied significantly across learning styles (See Table 1).

A Tukey's Honestly Significant Differences (HSD) test was then performed to determine which of the five 1st order constructs of EUCS differed statistically from the other within specific learning styles. From Table 2, the results showed significant differences among all five 1 st order constructs of EUCS at 95% confidence interval in assimilator quadrant. Thus we could say that Format (3.58) and Accuracy (3.57) ranks the first in Assimilator quadrant. Thus Timeliness (3.47) ranks the second in Assimilator quadrant similarly Ease of Use (3.24) and Content (3.22) rank the third in Assimilator quadrant. The other three quadrants showed the significances as well, the detailed illustrations are as follows.

Table 1: ANOVA Analysis of Learning Style and EUCS

		Sum of Squares	df	Mean Square	F	Sig.
CONTENT	Between Groups	1.169	3	.390	1.208	.307
	Within Groups	78.705	244	.323		
	Total	79.875	247			
ACCURACY	Between Groups	6.163	3	2.054	5.644	.001
	Within Groups	88.805	244	.364		
	Total	94.968	247			
FORMAT	Between Groups	2.539	3	.846	2.267	.081
	Within Groups	91.086	244	.373		
	Total	93.625	247			
EOUSE	Between Groups	3.915	3	1.305	2.504	.060
	Within Groups	127.177	244	.521		
	Total	131.093	247			
TIMELINESS	Between Groups	6.804	3	2.268	3.801	.011
	Within Groups	145.583	244	.597		
	Total	152.387	247			

Table 2: Four Quadrants of Learning Style in EUCS

	Assimilator		Converger		Accommodator		Diverger	
	Sample Means	Tukey's HSD	Sample Means	Tukey's HSD	Sample Means	Tukey's HSD	Sample Means	Tukey's HSD
ONTENT	3.22	C	3.13	C	3.04	C	3.08	D
CCURACY	3.57	A	3.93	A	3.84	A	3.95	A
ORMAT	3.58	A	3.52	B	3.79	A	3.60	B
OUSE	3.24	C	3.54	B	3.45	B	3.53	B
MELINESS	3.47	B	3.06	C	3.46	B	3.30	C

The results showed significant differences between the five subconstructs of EUCS at 95% confidence interval in converger quadrant. Thus we could say that Accuracy (3.93) ranked first in converger quadrant. Ease of Use (3.54) and Format (3.52) ranked second whereas Content (3.13) and Timeliness (3.06) ranked third .

The results also showed significant differences between the five subconstructs of EUCS at 95% confidence interval in Accommodator quadrant. Thus, we could say that Accuracy (3.84) and Format (3.79) ranked first in accommodator quadrant. Timeliness (3.46) and Ease of Use (3.45) ranked second and Content (3.22) ranked third in Accommodator quadrant. In Diverger quadrant, we can see that Accuracy (3.95) ranked first, Format (3.60) and EOUS (3.53) ranked second, Timeline (3.30) ranked third and Content (3.08) ranked fourth. From the analysis above we can conclude that the four quadrants of learning styles were different in five 1st order constructs of EUCS. The ranking orders of EUCS ware presented in figure 3.

Research Question #2: Moderating Effect - Gender

To answer the second research question, an analysis of variance (ANOVA) for four quadrants of learning styles in five 1st order constructs of EUCS was also conducted. Then, a Tukey's HSD was performed to determine the 1st order constructs of EUCS within specific learning styles.

The results showed only one 1st order constructs – Ease of Use ($F = 3.40$, $p < 0.05$) varied significantly across learning styles of female respondents (See Table 3). For male respondents, however, two 1st order constructs were presented with significances — Accuracy ($F = 4.72$, $p < 0.01$) and Timeliness ($F = 3.60$, $p < 0.05$) varied significantly across four different learning styles (See Table 5).

A Tukey's HSD test was performed to determine which of the five 1st order constructs of EUCS differed statistically from the other within specific learning styles. From Table 4, the results showed significant differences among all five 1 st order constructs of EUCS at 95% confidence interval in assimilator quadrant. Thus we could say that Format (3.56) and Accuracy (3.54) ranks the first in Assimilator quadrant. Thus Timeliness (3.47) ranks the second in Assimilator quadrant similarly Ease of Use (3.24) and Content (3.22) rank the third in Assimilator quadrant.

The results showed significant differences among all five 1st constructs of EUCS at 95% confidence interval in converger,

Figure 3: The Relations Between LSI and EUCS

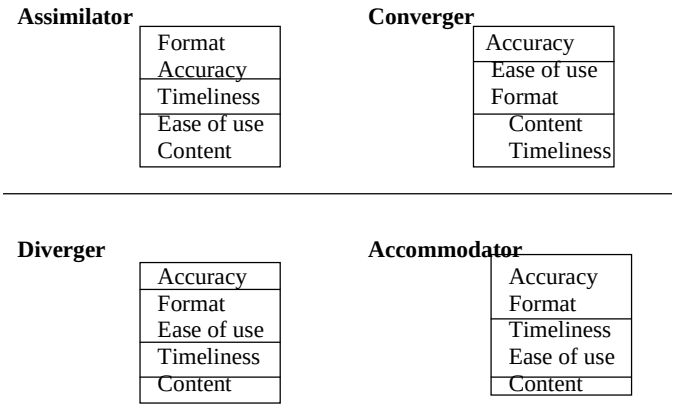


Table 3: ANOVA Analysis of Learning Style and EUCS of Female Respondents

		Sum of Squares	df	Mean Square	F	Sig.
CONTENT	Between Groups	1.164	3	.388	1.003	.394
	Within Groups	49.507	128	.387		
	Total	50.670	131			
ACCURACY	Between Groups	2.056	3	.685	1.714	.167
	Within Groups	51.187	128	.400		
	Total	53.242	131			
FORMAT	Between Groups	2.055	3	.685	1.602	.192
	Within Groups	54.740	128	.428		
	Total	56.795	131			
EOUSE	Between Groups	5.268	3	1.756	3.397	.020
	Within Groups	66.164	128	.517		
	Total	71.432	131			
TIMELINESS	Between Groups	1.777	3	.592	.939	.424
	Within Groups	80.701	128	.630		
	Total	82.477	131	.388		

Table 4: Tukey Analysis of Female Gender

	Assimilator		**Converger**		**Accommodator**		**Diverger**	
	Sample Means	Tukey's HSD	Sample Means	Tukey's HSD	Sample Means	Tukey's HSD	Sample Means	Tukey's HSD
ONTENT	3.24	C	3.15	D	2.99	D	3.06	C
CCURACY	3.54	A	3.85	A	3.79	A	3.60	A
ORMAT	3.56	A	3.48	C	3.82	A	3.63	A
OUSE	3.26	C	3.73	B	3.32	B	3.63	A
MELINESS	3.43	B	3.12	D	3.25	C	3.27	B

Table 5: ANOVA Analysis of Learning Style and EUCS of Male Respondents

		Sum of Squares	df	Mean Square	F	Sig.
CONTENT	Between Groups	.250	3	.083	.322	.809
	Within Groups	28.924	112	.258		
	Total	29.174	115			
ACCURACY	Between Groups	4.522	3	1.507	4.724	.004
	Within Groups	35.737	112	.319		
	Total	40.259	115			
FORMAT	Between Groups	.649	3	.216	.670	.572
	Within Groups	36.144	112	.323		
	Total	36.793	115			
EOUSE	Between Groups	2.593	3	.864	1.709	.169
	Within Groups	56.665	112	.506		
	Total	59.259	115			
TIMELINESS	Between Groups	6.113	3	2.038	3.597	.016
	Within Groups	63.448	112	.566		
	Total	69.560	115			

Table 6: Tukey Analysis of Male Gender

	Assimilator		**Converger**		**Accommodator**		**Diverger**	
	Sample Means	Tukey's HSD	Sample Means	Tukey's HSD	Sample Means	Tukey's HSD	Sample Means	Tukey's HSD
ONTENT	3.21	C	3.11	D	3.11	D	3.11	E
CCURACY	3.59	A	4.04	A	3.91	A	4.09	A
ORMAT	3.61	A	3.57	B	3.77	B	3.61	B
OUSE	3.22	C	3.34	C	3.63	C	3.43	C
MELINESS	3.52	B	3.00	E	3.61	C	3.34	D

accommodator, and diverger quadrants of female respondents. Thus we could say that Accuracy (3.79) ranked first in converger quadrant. Accurracy (3.79) and Format (3.82) ranked first in the accommodator quadrant, whereas Accuracy (3.60), Format (3.63) and Ease of Use (3.63) ranked first in the diverger quadrant (See Table 4).

A Tukey's HSD test was performed to determine which of the five 1st order constructs of EUCS differed statistically from the other within specific learning styles. From Table 6, the results showed significant differences among all five 1 st order constructs of EUCS at 95% confidence interval in four quadrants. In assimilator quadrant, Format (3.61) and Accuracy (3.59) ranks the first. Then Timeliness (3.52) ranks the second, similarly Ease of Use (3.22) and Content (3.21) rank the third. In converger quadrant, Accuracy (4.04) ranked the first, then Format (3.57), Ease of Use (3.34), Content (3.11), and Timeliness (3.00) the last.

The results showed significant differences among all five 1st constructs of EUCS at 95% confidence interval in, accommodator, and diverger quadrants of male respondents. Accurracy (3.79) ranked first in the accommodator quadrant, as well as Accuracy (4.09) in the diverger quadrant (See Table 6).

Table 7: ANOVA Analysis of Learning Style and EUCS of Older Respondents

		Sum of Squares	df	Mean Square	F	Sig.
CONTENT	Between Groups	2.456	3	.819	2.884	.039
	Within Groups	28.953	102	.284		
	Total	31.409	105			
ACCURACY	Between Groups	1.512	3	.504	1.587	.197
	Within Groups	32.394	102	.318		
	Total	33.906	105			
FORMAT	Between Groups	1.916	3	.639	1.716	.168
	Within Groups	37.973	102	.372		
	Total	39.889	105			
EOUSE	Between Groups	.696	3	.232	.483	.695
	Within Groups	49.051	102	.481		
	Total	49.748	105			
TIMELINESS	Between Groups	3.772	3	1.257	2.336	.078
	Within Groups	54.889	102	.538		
	Total	58.660	105			

Research Question #3: Moderating Effect - Age

Age as moderator has different effects of learning style on EUCS. Older age group (greater than and equal to 29 year-old) show significant effects of learning style on content ($F = 2.88$, $p<.05$) of EUCS (see Table 7). Younger age group (less than and equal to 27 year-old) show significant effects of learning style on two variables accuracy ($F = 3.01$, $p< .05$) and ease of use ($F = 3.49$, $p< .05$) of EUCS (see Table 9).

A Tukey's HSD test was performed on older respondent to determine which of the five 1st order constructs of EUCS differed statistically from the other within specific learning styles. From Table 8, the results showed significant differences among all five 1 st order constructs of EUCS at 95% confidence interval in four quadrants. In assimilator quadrant, Format (3.70) and Accuracy (3.66) ranks the first, Timeliness (3.52) and Ease of Use (3.56) ranks the second, similarly Content (3.48) rank the third. In converger quadrant, Accuracy (3.95) ranked the first, then Format (3.57), Ease of Use (3.42), Timeliness (3.15), and Content (3.07) the last.

The results showed significant differences among all five 1st constructs of EUCS at 95% confidence interval in, accommodator, and diverger quadrants of Older respondents. Format (3.92) ranked first in the accommodator quadrant, whereas Accuracy (4.00) ranks first in the diverger quadrant (See Table 8).

A Tukey's HSD test was performed to younger respondents to determine which of the five 1st order constructs of EUCS differed statistically from the other within specific learning styles. From Table

Table 8: Tukey Analysis of Older Respondents

	Assimilator		**Converger**		**Accommodator**		**Diverger**	
	Sample Means	Tukey's HSD	Sample Means	Tukey's HSD	Sample Means	Tukey's HSD	Sample Means	Tukey's HSD
ONTENT	3.48	C	3.07	E	3.17	D	3.25	E
CCURACY	3.66	A	3.95	A	3.87	B	4.00	A
ORMAT	3.70	A	3.57	B	3.92	A	3.64	B
OUSE	3.56	B	3.42	C	3.60	C	3.42	A
MELINESS	3.56	B	3.15	D	3.62	C	3.50	C

Table 9: ANOVA Analysis of Learning Style and EUCS of Young Respondents

		Sum of Squares	df	Mean Square	F	Sig.
CONTENT	Between Groups	1.923	3	.641	1.911	.132
	Within Groups	39.913	119	.335		
	Total	41.835	122			
ACCURACY	Between Groups	4.031	3	1.344	3.011	.033
	Within Groups	53.095	119	.446		
	Total	57.126	122			
FORMAT	Between Groups	.659	3	.220	.590	.623
	Within Groups	44.345	119	.373		
	Total	45.004	122			
EOUSE	Between Groups	5.416	3	1.805	3.493	.018
	Within Groups	61.491	119	.517		
	Total	66.907	122			
TIMELINESS	Between Groups	4.765	3	1.588	2.441	.068
	Within Groups	77.418	119	.651		
	Total	82.183	122			

Table 10: Tukey Analysis of Young Respondents

	Assimilator		Converger		Accommodator		Diverger	
	Sample Means	Tukey's HSD	Sample Means	Tukey's HSD	Sample Means	Tukey's HSD	Sample Means	Tukey's HSD
ONTENT	3.09	C	3.22	D	2.92	D	2.91	E
CCURACY	3.51	A	3.94	A	3.83	A	3.91	A
ORMAT	3.53	A	3.46	C	3.67	B	3.52	C
OUSE	3.12	C	3.59	B	3.35	C	3.61	B
MELINESS	3.46	B	2.96	E	3.37	C	3.13	D

10, the results showed significant differences among all five 1 st order constructs of EUCS at 95% confidence interval in four quadrants. In assimilator quadrant, Format (3.53) and Accuracy (3.51) ranks the first, Timeliness (3.46) ranks second ,Ease of Use (3.12) ranks the third, similarly Content (3.09) rank last. In converger quadrant, Accuracy (3.94) ranked the first, Ease of Use (3.59) rank second, Format (3.46) ranks third, Content (3.22) ranks fourth and Timeliness (2.96)the last.

The results showed significant differences among all five 1st constructs of EUCS at 95% confidence interval in, accommodator, and diverger quadrants of Younger respondents. Accuracy (3.83) ranked first in the accommodator quadrant, as well as in the diverger quadrant (See Table 10).

DISCUSSION

- While recognizing the benefits of matching learning styles with learning environments, acknowledges the potential longer term value of intentionally mismatching to develop the weaknesses in an individual's learning style, thereby promoting his or her ability to learn from a variety of learning perspectives.
- Convergers perceive reality through abstract conceptualization and process it through active experimentation. They are common sense learners who value practicality, productivity, and efficiency. They cut through to the bottom line and thrive on timeliness. (Kolb 1984 & 1985)
- The four quadrants of LSI may have limited the significance in the relations to the EUCS. The suggestion is that two dimensions of LSI may cause different results.
- The results of learning style is based on the learners themselves, but it doesn't rate the learning style preferences through standards or behavior as some other personal style inventories do, is one of the limitations.
- It would be interested to look at the time lag effects on EUCS, and see if LSI would change accordingly.
- Both EUCS and LSI scales are American-oriented, the subjects in other country may answer differently because the language barrier or mistranslations.

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