Ensuring Success in a Large Scale Software Project: An Examination of the Learning Styles and Characteristics of the Potential End Users

Yavuz İNAL[1, ♠], Hacer GÜNER[1]

[1]*TÜBİTAK BİLGEM Software Technologies Research Institute*

Abstract

Many software development projects face a high rate of failure, which prevents them from achieving the intended outcome. One of the reasons for this might be due to ignoring the end users during the development of the software. To counter this, well-organized training programs can be devised to show end users how to use the software. This training has a crucial role in the success and dissemination of the software development projects. The aim of this study was to examine the correlation between personality traits and learning styles of the end users in a large-scale software development project. The results of the study revealed that there was a distinct relationship between the learning styles and personal attitudes of the users. Personality traits such as extraversion and openness were found to be associated with the learning preferences of individuals. In Kolb's terms, the converger learners were more open than the diverger learners. Furthermore, the end users were mostly satisfied with the training program, which can be attributed to the efficiency of the curriculum design, sufficiency of the provided facilities and competence of the trainers.

1. INTRODUCTION

Software development projects have become pervasive in the modern world organizations with the advanced improvements of information technology. However, many of these projects have a high percentage of failure [1] and are unable to reach their intended goals. This situation motivates researchers to investigate the factors that can lead to the successful implementation of software development projects. Reluctance to involve the potential end users in the software development projects is thought to be one of the reasons behind the failure of such projects [2]. Research (i.e. [3-4]) reveals that engaging the end users in the program and assessing their satisfaction play a crucial role in the success and dissemination of the projects.

End user training programs have significant impacts on the level of acceptance and satisfaction of end users related to the developed software [5]. Attitudes of end users towards software projects can be positively or negatively altered by training [6]. For instance, when the end users receive training, they become more proficient and work effectively, efficiently and productively [29-30]. Therefore, it is essential to design and implement well-planned end user training programs, which will greatly contribute to the success of the software development projects.

The outcomes of the training programs may differ depending on the learning characteristics of the end users [7-8]. This shows the significance of conducting a

♠Corresponding author, e-mail: *yavuz.inal@tubitak.gov.tr*

learner analysis when organizing training programs. In the literature, the learning characteristics of end users were placed in the following four basic categories; concrete experience (CE), reflective observation (RO), abstract conceptualization (AC) and active experimentation (AE) [9]. CE means that individuals' learning process is heavily based on experience; learners with RO characteristics tend to watch other people and learn from their own observations; the AC type of learners learn best through logical and analytical thinking while people with AE characteristic prefer to actively learn by being involved in experiments. It is possible for individuals to have any combination of these four characteristics with one or two of the learning styles being dominant [9]. There are four main learning styles; accommodator, assimilator, converger and diverger. Accommodators enjoy doing experiments, solving problems, making independent discoveries and risk taking; assimilators are interested in abstract concepts, theoretical models and demonstrations; convergers prefer interaction, practical application of ideas, solving problems and exploring new things; and divergers have a good imagination and are good at brainstorming, emotional awareness and generating new ideas [9-10].

The learning styles of individuals can also be affected to different degrees by their personality, educational background, professional life, job environment and competence [10]. Several studies (e.g. [11-12, 15-17]) have reported a relationship between learning styles and personality. According to the Five Factor Model, personality traits of individuals are classified as extraversion, agreeableness, conscientiousness, neuroticism and openness [13-14]. Extravert individuals can be defined as being social, assertive, talkative and excited; agreeable individuals carry characteristics such as kindness, affection, helpfulness, trust, tolerance and sympathy to others; conscientiousness refers to responsible, organized, goal-directed, dependable and systematic personalities; neuroticism involves anxiety, sadness, emotional instability and moodiness; and openness is displayed through imagination, broad range of interests, intellectuality, creativity, curiosity and originality [14].

Furnham, who investigated the relationship between learning styles and personality traits using three different instruments of learning style, concluded that a 'systematic relationship' exists between the two, indicating that individuals seemed to differ in their learning styles/preferences with an obvious link to their personality traits. Another study conducted with first-year undergraduate psychology students at the University of Amsterdam showed that the learning styles of students were correlated with their personality [17].

The aim of this study was to examine the correlation between the personality traits and learning styles of the end users of a large-scale software development project. To this end, the factors that had a possible effect on the end users' satisfaction with the training program were analyzed. Based on the results, it was discussed how

such a relationship can be interpreted in a way that it can effectively be used in designing and implementing end user training programs.

2. METHOD

2.1 Participants

The sample of this study consisted of a total of 191 end users who participated in a face-to-face, in-class training program of a large-scale software development project. Of the participants, 125 (65.4%) were female and 66 (34.6%) were male. The age of the participants varied between 22 and 48. Their education levels also varied including high school or lower education degree (5.2%), two-year undergraduate degree (9.9%), four-year undergraduate degree (62.3%), M.S. degree (20.9%) and Ph.D. degree (0.5%).

2.2 Instruments

2.1.1 Kolb's Learning Style Inventory

Learning Style Inventory (LSI) was developed to assess the learning styles of individuals based on their learning characteristics [18]. The inventory was adapted and translated into Turkish by Aşkar and Akkoyunlu [19]. In the current study, the Turkish version of Kolb's LSI was used. This inventory consists of 12 items each with four statements that aim to assess the four groups of learning characteristics explained above; CE, RO, AC and AE. The participants were asked to rate each statement from strongly agree (1) to strongly disagree (4). The sum of the scores for each item gives the value for each characteristic (CE, RO, AC, or AE). For example, the difference between AE and RO scores indicates the participant's learning preference on an active-reflective scale while the difference between AC and CE scores shows learning preference on an abstract-concrete scale. Based on the subtracted values, the scores of the participants are placed on a four quadrant graph representing learning styles as 'accommodator' (dominant abilities are AE and CE), 'assimilator' (AC and RO), 'converger' (AC and AE) and "diverger" (CE and RO) [10].

2.1.2 The Big-Five Inventory

The Big-Five Inventory (BFI) was developed by Benet-Martinez and John [20] to evaluate five personality dimensions: extraversion (8 items), agreeableness (9 items), conscientiousness (9 items), neuroticism (8 items) and openness (10 items). The inventory was adapted and translated into Turkish by Sümer and Sümer [21] as part of an international study [22] investigating personality dimensions across 56 different nations. In the inventory, attendants are asked to score each item from 5 (totally agree) to 1 (totally disagree). The mean scores of each item group give the values for the corresponding personality trait.

2.1.3 Training Satisfaction Inventory

Training satisfaction inventory was developed within the scope of institutional training facilities to assess the end users' satisfaction with a particular training program. The items of the inventory are based on

factors that were found to affect end users satisfaction in previous research [23-24]. The inventory consists of 15 Likert-type items to evaluate the content, organization and schedule of the training program (4 items), trainers' performance (8 items), and instructional materials and training environment (3 items). Participants are asked to rank each item from 5 (*totally agree*) to 1 (*totally disagree*). The average score of all items gives the satisfaction level of the corresponding participant that had participated in the training.

2.3 Data Collection and Analysis

The end user training program was planned and organized in 12 different groups; each consisting of 15-18 end users and two trainers. Each program lasted two days and the entire program was completed in six weeks. During the program, participants were trained in the use of the developed software.

At the end of the first day of the training program, the end users were asked to complete two inventories involving questions that measured their learning styles and personality traits. At the end of the second day, the participants were also asked to fill in the training satisfaction inventory to measure their satisfaction with the program. The data gathered from the inventories was analyzed using the SPSS 20 software. The relationship between learning styles and personality types were examined using a correlational analysis and one-way analysis of variance (ANOVA) test.

3. RESULTS

3.1 Participants' Satisfaction with the Training Program

The results of the training satisfaction inventory revealed that the end users' level of satisfaction was

77.5% related to the content and schedule of the training program, 95.66% related to the trainers and 86.67% concerning the instructional materials and training environment. The overall training satisfaction level was found to be 95.0%. These results demonstrated that most of the participants were satisfied with the training program. The highest level of satisfaction was found in relation to the performance of the trainers. On the other hand, participants seemed to be less satisfied with the content and schedule of the program.

3.2 The Relationship between the Learning Styles and Personality Traits of the Participants

Pearson's correlational analysis was used to analyze the relationship between the learning characteristics of the participants and their personality traits. In Table I, Kolb's learner characteristics and the Big-Five personality traits are distributed horizontally (the top row) and vertically (the left-most column) using the numbers 1 to 9. The intersecting cells in parenthesis on the diagonal shows Cronbach's α value of the bivariate correlations of the corresponding scales.

The internal reliabilities of the variables were ranging from 0.54 (Agreeableness) to 0.76 (Abstract Conceptualization). The results of the analysis indicated that those who mainly described themselves as extraverts displayed a negative relationship with RO *(r=-.16, p< .05)* and a positive relationship with AE *(r=.14, p< .05)*. Similarly, those who mainly described themselves as being open to experience, were found to have a negative relationship with RO *(r=-.15, p< .05)* (Table I). On the other hand, no significant relationship was observed between the Big-Five personality traits and Kolb's learner characteristics of CE and AC.

Table I. Bivariate correlations of Kolb's learner characteristics and the Big-Five personality traits

Variables (N=191)	1	2	3	4	5	6	7	8	9
1 Concrete Experience (CE)	(0.74)								
2 Reflective Observation (RO)	-.25[**]	(0.71)							
3 Abstract Conceptualization (AC)	-.35[**]	-.33[**]	(0.76)						
4 Active Experimentation (AE)	-.32[**]	-.27[**]	-.20[**]	(0.64)					
5 Extraversion	-.03	**-.16[*]**	.03	**.14[*]**	(0.74)				
6 Openness	-.01	**-.15[*]**	.12	.04	.50[**]	(0.72)			
7 Conscientiousness	-.12	-.06	.01	.11	.29[**]	.25[**]	(0.55)		
8 Neuroticism	.02	.05	-.08	-.03	-.27[**]	-.22[**]	-.44[**]	(0.71)	
9 Agreeableness	-.05	.04	-.05	.05	.21[**]	.22[**]	.30[**]	-.46[**]	(0.54)

Note: Cronbach's α values of the corresponding scale are shown in parenthesis on the diagonal. *p< .05;**p< .01.

The results revealed that extravert participants prefer learning activities that involve more actions and less reflecting. This suggests that end users who are dominantly characterized as social, talkative, assertive and excitable are less likely to learn by watching others

and their observations. These participants did not seem to enjoy learning from lecture format instruction, self-reflection exercises and brainstorming. However, they reported that they learned better by being actively involved in experiments, practicing and experimenting.

Furthermore, participants who described themselves as being open to experience less preferred the style of learning by reflecting on observations. It means that the attendants who described themselves as imaginative, adventurous, curious and insightful mostly did not like lectures and objective tests during a learning process. This can be interpreted as participants who described themselves as imaginative, adventurous, curious and insightful mostly not finding lectures and objective tests appropriate as part of the learning process.

The ANOVA test was used to examine whether the end users with different learning styles differ in terms of personality dimensions. The results revealed that the effect of learning style was significant with $F(3, 187) = 3.14$, $p < .05$. The post-hoc analysis using Turkey's HDS criterion for significance indicated that openness to experience scores obtained from the converging learning style were significantly higher ($M= 4.15$, $SD= 0.48$) than those from the diverging learning style ($M= 3.81$, $SD= 0.58$). In other words, those who with a converging learning style had a higher score in the openness dimension than those with the diverging learning style. This indicates that participants who prefer learning from interactive instruction and being involved in problem solving activities seem to have more creativity, aesthetic sensitivity, intellectual curiosity, and originality than those who mostly learn through lectures and brainstorming.

4. DISCUSSION

The success of software projects relies on the involvement of end users in the software development life cycle as well as their attitude towards and acceptance of the developed software [2] [25]. Moreover, training end users can facilitate the adoption of the developed software and improve the attitudes of end users towards it [5-6]. Previous studies (i.e. [26-27]) indicated that training users is one of the fundamental steps to increase user satisfaction, which clearly has an impact on the success of software development projects. Therefore, it is crucial to organize training programs that will satisfy the needs and expectations of the end users. To develop an understanding of these needs and expectations, the characteristics of the end users can be analyzed at the beginning of the course.

In the present study, the results of the training satisfaction inventory showed that the end users had a high level of satisfaction (95%) with the overall training program. Three main factors may have affected this result; organization and management of the training program, competence of the training program in terms of meeting the demands of the end users and performance of the trainers [23].

Effective organization and management of the program is the first factor that has an impact on the participants' satisfaction with the training. It has been reported that end users are more satisfied when provided with instructional materials, a learning environment with good physical conditions and appropriate program schedule [23]. Similarly, in this study, the quality of the

instructional materials, comfort of the training environment (such as room temperature, and classroom setting) and the convenience of the program schedule may have contributed to the participants' overall satisfaction with the program. However, the findings of the training satisfaction inventory indicated that the participants were relatively less satisfied with the content and the schedule of the training program, which indicates that their related expectations were higher.

Secondly, whether the training program addresses the demands of end users can have a significant impact on the training satisfaction. The level of satisfaction is increased by an effectively designed curriculum, which meets the end users' demands and expectations and the end users' perception that the given instruction is useful for both theoretical and practical aspects of their work [23]. In this study, the participants were provided with a training that involved both instructional and practical use of the developed software.

As a third factor, performance and competence of trainers can be a determinant of the level of satisfaction with training. In other words, the more end users perceive trainers as proficient and qualified, the higher their level of overall training satisfaction is [23]. In the current study, the results of the training satisfaction inventory revealed that the participants were most satisfied with the trainers' performance. The trainers involved in the study were proficient and well-experienced in adult training. They were both competent in operating the developed software and well informed about the business rules and regulations to be followed when using the software. This suggests that end users' satisfaction with the trainers can be attributed to the trainers' proficiency, experience and competency.

Previous studies (i.e. [12] [15-17]) concluded that there is a relationship between personality traits and learning styles of individuals. For example, extraversion, conscientiousness and openness have been shown to be correlated with learning and education [28]. Having an extravert personality has been reported to be positively related with Kolb's converger learning style [15]. This finding suggests that extravert individuals prefer the style of interactive and hands-on instruction. This is also in agreement with the findings of the current study, indicating that individuals who described themselves as social, talkative, assertive and enthusiastic, which are typical attributes of extraversion, favored learning experience in which they were actively involved in experiments, solved problems and participated in discussions. These participants did not prefer learning through lectures, observations and self-reflection assignments. The current study also revealed that open individuals, who have intellectual, emotional, imaginative and adventurous personalities, tend to learn better from their own observations, watching others and listening to lectures.

According to the results of the current study, converger learners, who prefer solving problems, active participation and practical application of ideas, seem to be more open to experience than diverger learners, who mostly learn through collaboration, group working and

receiving systematic and detailed information. Similarly, individuals with the converging learning style may differ from those with diverging learning styles in terms of level of imagination, creativeness, emotionality and intellect.

5. CONCLUSION

The results of this study can be used for planning various training programs in similar software development projects that involve end users from a wide range of geographical regions. To be able to delve deeper into the characteristics of the end users, future research can be conducted to include the assessment of the training preferences of end users as a factor using data from the learning styles and personality types of the potential end users,. Analyses showing a clear picture of the relationship between training preferences and learning characteristics of end users and their personality can provide great contributions to the design and implementation of more efficient and effective training programs.

CONFLICT OF INTEREST

No conflict of interest was declared by the authors.

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