The Role of Personality of Software Developers in Selecting Software Development Methodology

Abdu Mekonnen
Awolia College, Addis Ababa, Ethiopia
abdu_mekonnen@yahoo.com

Workshet Lamenew
School of Information Science, Addis Ababa University, Ethiopia
workshet@gmail.com

Abstract

In software development, among the challenging tasks is to select development methodology that is of most appropriate to meet the needs of system requirements, context, problem domain complexity, and development team. The main issues related to the development team are: personality of developers, team experience, team maturity, team size, and organizational culture.

The objective of this paper is to investigate the relationship and the consequences of personality traits of software developers with appropriate software development methodology selection (plan-driven and agile). Then, we made various statistical analyses on the collected data.

The empirical evidence presented in this paper suggests that there are significant correlations between the SE-Six Personality Assessment Factors and Plan-Driven Software Development Methodology. The personality traits which are significantly correlated with Plan-Driven Software Development Methodology are: extraversion, agreeableness, openness, conscientiousness and cognitive capability. Appropriate software development methodology selection as per developers' specific personality traits may help in better staffing of development teams, the success of software projects and better performance with less conflict. In this research, we didn't find statistically significant relationship among the SE-Six Personality Assessment Factors and agile methodology. All in all, the research showed us that there is relationship among personality and cognitive capability of software developers' preference of software development methodology. Because this is a very important relationship we recommend further researches to be conducted in this area to get the most benefit out of it.

Keywords: Agile; Plan-Driven; Software Development Methodology; SE-Six Personality Assessment Factors

1. Introduction

As the Software Engineering (SE) field has expanded beyond an almost purely technical realm since the early 1970s, the community is slowly realizing the importance of the human factor [1]. Albeit earlier SE researches were, we can say fully focused on technical aspects, recent research works, however, are emerging that deal with human and social aspects. Several researches on the human aspects of SE are conducted in various universities and software companies by various researchers and practitioners. Yet, most of these researches focus on fundamentals where software developers are categorized into different personality types as compared to a larger population [1]. The research agenda of previous works on personality and SE revolve around concepts such as software developers learning situation [11], area of specialization prediction [3], recruitment for a job [4, 5], team formation and cohesion [13], identifying personality types and attributes of software engineers (personality profiles) [1, 7] and relationship between personality and software engineering [2], personality as a moderating factor between requirement uncertainty and performance of software developers [8], conflicts among software engineers [14], and personality on specific software development methodologies [9, 10, 12].

This research is initiated, based on the work done in [12], to investigate the role personality of software developer plays in selecting appropriate SDM using a different personality model called SE-Six Personality Assessment Factors model (a name coined in [3] and

adopted for this work) and context by filling some gaps the research manifests.

We did this after conducting a survey (making some mobile phone interviews to some individuals who have immense industrial experience and making discussion with others) on how a software project team is formed in Ethiopian software companies. We found out that a software development team is formed based on the traditional method: simple hand picking/random selection, experience in technical skills and other merits developers have no matter what the software development methodology is. This has got its own inevitable problem. If we select only experienced developers, there will be lack of communication and conflict as everyone thinks ones ideas are far better than the other. If we form teams by inexperienced developers, the learning curve will be high as a result of which the project won't be completed on the allotted resources. If a project team is formed by simple hand picking/random selection, we may not get the required developers who perform the job as we expected them to.

Similar problems are cited in the country's software development industry by previous work as more technical tasks like programming were taken as relatively less problematic. What are more problematic and challenging are managerial and organizational tasks such as project planning, requirements gathering, coordination, and communication [13].

As pointed out clearly in various software engineering research works, team formation plays a very vital role for the success of software development projects. So, team formation should be free from all obstacles that hinder the achievement of quality software production and performance improvement. Therefore, what we proposed as a solution to the above cited other similar problems is software development methodology selection based on the preferences of software developers. This in turn helps us in team formation which is diversified enough in handling complex tasks like that of software engineering and free from conflicts among team members.
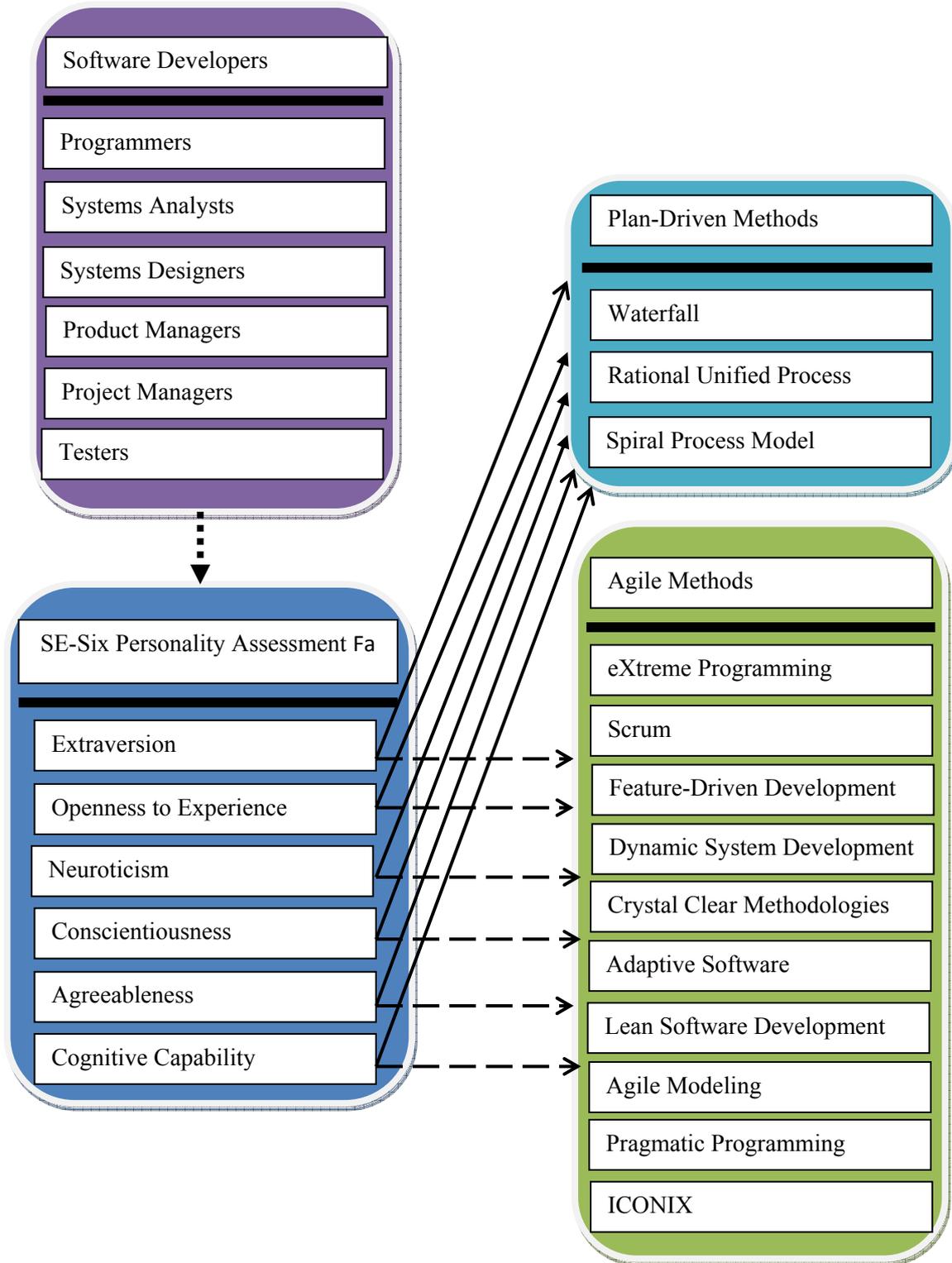
2. Methodology

We used standardized questionnaire to collect data from 60 respondents from software developing companies as well as companies that have IT departments located in Addis Ababa. The data we gathered were about respondents' personality and cognitive capability types as well as their preferences of software development methodologies (SDM) (plan-driven or agile). After making pre-test and ensuring the internal validity of the sample questionnaire, we conducted correlational and multivariate regression analysis on the actual collected data to generate the results we arrived at.

3. Research Model

To test the correlation between SE-Six Personality Assessment Factors (Extraversion, Conscientiousness, Agreeableness, Cognitive Capacity, Openness to Experience New Things and Neuroticism) and the two commonly used software development methodologies (plan-driven and agile), six hypotheses are proposed after making thorough literature consulting. Thus, the hypotheses are the ones described below in line with the research model shown in Figure 1.

As working in teams requires the ability to be able to tap in to each other's expertise and knowledge, extraverted developers may be more successful at it due to their social/political skills [8, 12].

Software Developers

Programmers

Systems Analysts

Systems Designers

Product Managers

Project Managers

Testers

SE-Six Personality Assessment Fa

Extraversion

Openness to Experience

Neuroticism

Conscientiousness

Agreeableness

Cognitive Capability

Plan-Driven Methods

Waterfall

Rational Unified Process

Spiral Process Model

Agile Methods

eXtreme Programming

Scrum

Feature-Driven Development

Dynamic System Development

Crystal Clear Methodologies

Adaptive Software

Lean Software Development

Agile Modeling

Pragmatic Programming

ICONIX

→ Relationship between SE-Six Personality Assessment Factors and plan-driven

– – → Relationship between SE-Six Personality Assessment Factors and agile SDM

••••• ▶ Personality traits that describe Software developers

Figure 1: Research Model

Hypothesis a1*: there is a positive correlation between the introversion personality trait and an individual's predilection for following a plan-driven software development methodology.*

Hypothesis b1*: there is a positive correlation between the extraversion personality trait and an individual's predilection for following an agile software development methodology.*

People who are open to change are more likely to revel in situations such as dynamic changes in the project requirement and like the challenges that come with it. It can be expected that the challenge will motivate them to perform well and to become agile in such conditions of uncertainty [8, 12].

Hypothesis a2*: there is a positive correlation between less open to experience to new things personality factor and an individual's predilection for following plan-driven methodology.*

Hypothesis b2*: there is a positive correlation between the openness to experience to new things personality factor and an individual's predilection for following agile software development methodology.*

Neurotic people are not sociable and are hostile. They are not likely to acquire the knowledge and information that is required to handle the new challenges in the project [8, 12]. So, it is expected that people with neurotic personality have a tendency to follow plan-driven software development as all the requirements are stable, risk is well defined and the whole process is mature, systematic and well documented.

Hypothesis a3*: there is a positive correlation between neurotic personality and an individual's predilection for following plan-driven software development methodology.*

Hypothesis b3*: there is a positive correlation between emotionally stable personality and an individual's predilection for following agile software development methodology.*

Individuals with a conscientious personality trait are goal oriented and are persistent and organize and actively plan, organize and carry out tasks. Conscientious people are able to align themselves as per the situation requirements, so as to achieve the goal. So we can expect that those with a

conscientious personality trait will exert themselves to do well on the software development project. Even in cases of dynamic project requirements, it can be expected that, being highly organized and dutiful, they can more systematically approach the challenge and emerge successful [8, 12].

Hypothesis a4*: there is a positive correlation between the conscientiousness personality trait and a predilection for following a plan-driven software development methodology.*

Hypothesis b4*: there is a positive correlation between the non-conscientiousness personality factor and an individual's predilection for following agile software development methodology.*

Agreeable people are more likely to be ready to share their knowledge with others to overcome the challenges in the project. They facilitate smooth knowledge sharing among team members. But in critical situations, like requirement uncertainty, where one is required to take a position of authority to proceed forward, people with an agreeableness personality trait are likely to avoid taking the appropriate actions to avoid being un-agreeable [8, 12].

Hypothesis a5*: There is a positive correlation between agreeableness personality trait and an individual's predilection for following plan-driven software development methodology.*

Hypothesis b5*: There is a positive correlation between non-agreeable personality trait and an individual's predilection for following agile software development methodology.*

Cognitive ability will have a positive impact on plan-driven methodologies where there is pre-planning and not much collaboration among developers themselves and developers with users. So far as agile methodologies are concerned, cognitive ability will have two impacts and these are additive (group average) and compensatory (higher ability group members help lower group members) [15].

Hypothesis a6*: there is a positive correlation between cognitive capability and an individuals' predilection for following plan-driven software development methodologies.*

Hypothesis b6*: there is a positive correlation between cognitive capability and an individual's*

predilection for following agile software development methodologies.

After making various statistical analyses, the empirical evidence has established that there is a significant relationship between personalities attributes extraversion, agreeableness, openness to experience new things, conscientiousness and cognitive capability and plan-driven software development methodology. We couldn't find any significant relationship between any personality trait and agile methodology as shown in Table 1.

Table 1: Regression on plan-driven and agile methodology

	Agile Development Methodology			Plan-Driven Development Methodology		
	Standardized Coefficients (β)	*Std. Error*	*Sig.*	*Standardized Coefficients (β)*	*Std. Error*	*Sig.*
Extraversion	.086	.125	.508	.389	.093	.000
Neuroticism	.072	.143	.586	.124	.107	.232
Agreeableness	.144	.156	.312	-.258	.117	.024
Conscientiousness	.235	.175	.163	.269	.131	.044
Openness	-.096	.176	.573	-.410	.131	.003
Cognitive	.168	.199	.277	.471	.149	.000

Dependent Variable: Agile

Dependent Variable: Plan-Driven

4. Discussion

After making correlation and regression analysis, we found less statistically significant relationship among personality traits and agile methodology for the level of statistical significance ($\rho > .05$). Albeit the relation is not a significant one, direction wise we found the same result with the same previous research [12] concerning agreeableness personality trait and agile methodology (negative relationship). Developers with agreeableness personality traits are found to be trusting, caring and helpful. These traits might be important in agile methodology where virtually all activities are done together and where there is a need for high cooperation and coordination among developers so that they will be able to share codes and do pair programming smoothly. As described in the sixth hypothesis, cognitive capability has an additive or compensating effect on performance of agile project teams.

In other words, the performance contribution of cognitive capability to agile team is less significant when it is compared to plan-driven. In other words, how people work together is a stronger predictor of performance than the individual skills and abilities of team members [14].

Yet, we found significant relationship between personality traits such as extraversion, less-openness to experience new things, conscientiousness, cognitive capability and plan-driven SDM (level of statistical significance $\rho < .05$).

Plan-driven SDM assumes that it is possible to have perfect understanding of the requirements from the start. It predicts everything (architecture, budget, etc.) from the start and continues working on it. So, developers who are *less-open to experience new things* may like to follow it as everything in this methodology is pre-planned and no change till a project is over. There is also a lot of planning and organizing in this SDM at the commencement of a software development project. This situation may demand the need of assigning developers who have *conscientiousness* personality trait to plan-driven software development projects. Besides, in plan-driven SDM, system analysis demands a great deal of human interaction with users and clients.

To communicate with users and management, *extroverts* are better at talking and getting responses than introverts, since introverts have a difficult time achieving a problem representation with users due to their internal orientation [12].

In brief, to do tasks like liaising extensively with external or internal clients, translating client requirements into highly specified project briefs and drawing up specific proposals for modified or replacement systems developers with extraversion

personality trait are preferred. Because every phase of plan-driven task is done by certain developers till the activities are over and there is no much cooperation among individuals, *non-agreeable* developers work fine in such situation. Plan-driven SDM is also an approach that incorporates less cooperation and communication among team members due to which good performance can be achieved when individual members have good *cognitive capability*.

5. Conclusions

In this study, we have attempted to understand the various working personalities of software developers so that we will be able to predict their preference of software development methodologies that are socially acceptable. This work investigated the applicability of personality traits of software developers as a predicting tool for the best suitable and adoptable software development methodology of their preference.

We have tested six hypotheses after making rigorous and meticulous literature reviews. After that we came to know that there are significant relationships among all the personality factors save neuroticism and plan-driven software development methodology. However, we found no significant relationship between all the personality factors and agile methodology. This might be due to the fact that agile methodologies do not have a strong ground in the country's software development industries and software engineering schools that are available might not be giving practical trainings using agile methodologies.

References

[1] Maria Samuelsson, "Personality Types and Attributes in Software Engineering", Thesis for Master of Science in Software Engineering, August 15, 2005.

[2] Robert Feldt, Lefteris Angelis, Richard Torkar, and Maria Samuelsson, "Links between the personalities, views and attitudes of software engineers", January 11, 2010.

[3] A. S. Sodiya, H. O. D. Longe, S. A. Onashoga, O. Awodele, and L. O. Omotosho "An Improved Assessment of Personality Traits in Software Engineering", Interdisciplinary Journal of Information, Knowledge, and Management Volume 2, 2007.

[4] Faheem Ahmed and Luiz Fernando Capretz, "Why Do We Need Personality Diversity in Software Engineering?" ACM SIGSOFT Software Engineering Notes, March 2010.

[5] Luiz Fernando Capretz and Faheem Ahmed, "Making Sense of Software Development and Personality Types", IT Pro, January/February 2010.

[6] Luiz Fernando Capretz, "Personality types in software engineering", 1 November 2002.

[7] Daniel Varona, Luiz Fernando Capretz, and YadenisPiñero, "Personality types of Cuban software developers", Global Journal of Engineering Education, Volume 13, Number 2, 2011.

[8] Sankara Subramanian Srinivasan, "Performance under Requirements Uncertainty: A Personality Perspective", Pacific Asia Conference on Information Systems (Pacis), Pacis 2009 Proceedings.

[9] Jo E. Hannay, Erik Arisholm, Harald Engvik, and Dag I.K. Sjøberg, "Effects of Personality On Pair Programming", IEEE Transactions on Software Engineering, Vol. 36, No. 1, pp. 61-76, January/February 2010.

[10] Andrew J. Dick and Bryan Zarnett, "Paired Programming & Personality Traits", pp.82-85.

[11] Vicente Rodríguez Montequín, Joaquín Villanueva Balsera, José Manuel Mesa Fernández, and Alberto García Nieto, "Using Myers-Briggs Type Indicator (MBTI) as a Tool for Setting up Student Teams for Information Technology Projects", Journal of Information Technology and Application in Education (JITAE), JITAE Vol.1 No. 1, 2012, pp.28-34.

[12] Anuj Sharma and Shubhamoy Dey, "Agile or Plan-Driven: Software Development Methodology Selection Using Personality Traits of Developers", Indian Institute of Management, Indore, India, Eproceedings for 2011 International Research Conference and Colloquium Contemporary Research Issues and Challenges in Emerging Economies.

[13] Tesfaye Biru, "Reflective Steps: A Collaborative Learning Oriented Approach to

Software Development and Process Improvement" Software Engineering Dissertation, October 2008, pp. 77-80.

[14] John Karn, "An Ethnographic Study of Conflict in Software Engineering Teams", Journal of Information, Information Technology, and Organizations Volume 3, 2008, pp. 106.

[15] Madeline Ann Domino, Rosann Webb Collins, Alan R. Henver, and Cynthia F. Cohen, "Conflict in Collaborative Software Development", pp. 45, available at www. porta.acm.org.