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Using Personality Traits to Understand the Influence of Personality on Computer Programming:
An Empirical Study

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ABSTRACT

Computer programming is complex and all personality factors might influence it. Personality factors are comprehensive but broad and, therefore, lower level traits may help understanding the influence of personality on computer programming. The objective of this paper is to extend the empirical knowledge in software psychology by using narrow personality traits as well as broad personality traits to explain the influence of personality. The authors surveyed 68 programming students developing software projects to investigate the influence of personality on performance in computer programming. They measured five broad personality factors, 17 personality facets, prior experience, attitude and self-assessed survey performance. They also used the grade students achieved in the software projects as an indicator of software quality. It was found that prior programming experience, attitude towards programming, academic performance, Openness to Experience, Conscientiousness, Extraversion and Agreeableness have a positive effect on performance in computer programming. However, one facet of Openness to Experience and facets of Neuroticism revealed negative effect. The authors found an indication that different aspects of personality factors have different influences on computer programming. Personality facets show larger effect than personality and help explaining the influence of personality. More studies are needed to strengthen the findings and clarify the situation.

KEYWORDS

Computer Programming, Empirical Study, Five Factor Model, Personality, Personality Facets

1. INTRODUCTION

There are large individual differences among computer programmers. Sackman et al. (1968) was one of the pioneers who observed 28:1 differences among programmers. Robert Glass (2002) reported this finding as one of the 50 important facts in software engineering. As another fact, he emphasized that the most important factor in software development is the quality of the programmer (performance in programming). Curtis (1968) models performance in programming with specific characteristics that distinguish one individual from another and affect their performance such as experience, attitude and personality.

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Personality has been a subject of interest in the context of programming since 1956 (Rowan 1956) and it is still interesting. Recently we systematically reviewed the related literature on the influence of personality on computer programming (see summarized results in section 2.2). Although we found an indication that personality affects performance, this relation is ambiguous. We think it is worthwhile performing new empirical studies and analysing the influence of personality on computer programming.

Psychologists describe personality as a collection of characteristics (Clonninger 2004). Yet they are not sure how many and which narrow characteristics should be considered in a comprehensive personality model; generally, they have a good consensus about the comprehensiveness of the *Five Factor Model* (Digmann 1990). In this model, five broad and distinct characteristics (factors) describe personality: *Openness to Experience*, *Conscientiousness*, *Extraversion*, *Agreeableness* and *Emotional Stability.*

Costa and McCrae (1985, 1992, 1995) further narrowed each of the personality factors in the *Five Factor Model* with six facets, each of which distinguishes specific and unique aspects of a broader personality trait. For example, *Openness to Experience* distinguishes imaginative, creative people from down-to-earth, conventional people. This broad trait is described by six facets, (1) *Imagination*: receptivity to the inner world of imagination, (2) *Aesthetics*: appreciation of art and beauty, (3) *Feelings*: openness to inner feelings and emotions, (4) *Actions*: openness to new experiences on a practical level, (5) *Ideas*: intellectual curiosity and (6) *Values*: readiness to re-examine one's own values and those of authority figures. Costa and McCrae (1995) indicated that because facets are more concretely tied to specific behaviours and experiences, it is likely that facet scales will often prove more useful than factor scales in the interpretation of personality.

Therefore, we state the hypothesis that personality facets can help clarify the influence of personality in computer programming. For example, using personality facets we can see which specific characteristics of *Openness to Experience* might influence programming and explain for example why sometimes this trait is (or is not) influential. The *Five Factor Model* is increasingly used in software psychology (Cruz et al. 2011) but to the extent we know, there is no study on the influence of personality facets on programming (see review in section 2.2).

In this paper, we describe an empirical study on investigating the influence of personality on computer programming and investigate facets in addition to factors to explore this influence. To do so we surveyed five personality factors and 17 facets of 68 volunteer student programmers in Software Engineering at the University of Stuttgart who were working in teams of 3 to 10 members to develop software projects as part of their courses.

To measure their performance in programming, we asked the participants (in the survey) to rate their abilities in programming. Moreover, we analysed the quality of their work in the projects, as an indicator for software quality, using the grades they get in the project.

In summary, in this study, we not only advance the growing body of empirical knowledge in the field of software psychology but also we contribute a novel investigation of personality facets.

In section 2 and 3, we explain the background and related work about personality and programming. We describe the design of the empirical study in section 4. Then we present the statistical analysis in section 5, discuss the results in sections 6 and 7, and present the limitations, future research and conclusion in sections 8, 9 and 10.

2. PERSONALITY IN PSYCHOLOGY

Psychology is a collection of scientific methods and theories for understanding human nature, and describing personality is a part of psychology that considers characterizing individuals. Psychologists usually describe personality with a collection of personality traits (Cloninger 2004). For each individual, each personality trait has a numeric score indicating how much of the trait an individual possesses.