The Affect of Software Developers: Common Misconceptions and Measurements

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Abstract—The study of affects (i.e., emotions, moods) in the workplace has received a lot of attention in the last 15 years. Despite the fact that software development has been shown to be intellectual, creative, and driven by cognitive activities, and that affects have a deep influence on cognitive activities, software engineering research lacks an understanding of the affects of software developers. This note provides (1) common misconceptions of affects when dealing with job satisfaction, motivation, commitment, well-being, and happiness; (2) validated measurement instruments for affect measurement; and (3) our recommendations when measuring the affects of software developers.

I. INTRODUCTION

Affects—emotions and moods—play a role in people’s daily job; they pervade organizations, the relationships between workers, deadlines, work motivation, sense-making, and human-resource processes [1]. Although emotions have been historically neglected in studies of industrial and organizational psychology, an interest in the role of affects on job outcomes has accelerated over the past fifteen years in organizational psychology [2], and lately, in software engineering [3]. Still, software engineering research is lacking an understanding of how affects have a role in the software construction process [4]. This paper builds upon our experience on the affects of software developers [1]. It reports (1) common misconceptions of affects when job satisfaction, motivation, commitment, well-being, and happiness are dealt with in literature; (2) validated measurement instruments for affect measurement; and (3) our recommendations when measuring the affects of software developers.

II. COMMON MISCONCEPTIONS

We have found that there are some common misconceptions in literature regarding affects. The first is job satisfaction, which is often confused with affects in a workplace. Job satisfaction is an attitude, not an affect [5]. An attitude is an evaluative judgment made with regard to an attitudinal object, in this case one’s job [6]. The current definitions of job satisfaction “have obscured the differences among three related but distinct constructs: evaluations of jobs, beliefs about jobs, and affective experiences on jobs.” [6], p. 173). More precisely, job satisfaction is “a positive (or negative) evaluative judgment one makes about one’s job or job situation.” [6], p. 175).

Affects are not motivation, either. Mitchell defined motivation as “those psychological processes that cause the arousal, direction, and persistence of voluntary actions that are goal directed.” [7], p. 81). This definition already suggests that motivation is not an affect, however the two constructs appear to be related. According to Seifert [8], when presented with a task, individuals perform evaluative judgments about the task itself, and they respond affectively based upon task and personal characteristics. These generated affects dictate successive motivation towards the task.

Commitment has been defined as a psychological state of attachment that defines the relationship between a person and an entity (organization) [9]. Commitment is multifaceted. According to Meyer and Allen [10], commitment is conceptualized in the forms of affective, normative, and continuance commitment. While normative and continuance commitment deal with perceived moral obligations and the awareness of the costs associated with leaving the organization respectively, affective commitment refers to an employee’s attachment to, identification with, and involvement within an entity, e.g., an organization, a project, or a team.

Similar to job satisfaction, well-being is an attitude [11]. Subjective well-being consists of two interrelated components, which are life satisfaction that refers to a cognitive sense of satisfaction with life [11], and positive and negative affects. Subjective well-being can be considered as one’s self-evaluation of life, which is influenced by affects.

Happiness, on the other hand, is a complex construct, which has different psychological and philosophical definitions. We adhere to Haybron’s [12] view of happiness as a matter of a person’s affective condition, where only central affects are concerned. An individual is happy if the person’s affect balance is characterized by frequent central positive affects. As a counter-example, the pleasure of eating a cracker is not enduring and probably not affecting happiness; therefore, it is considered a peripheral affect.

The affects of individuals are related to all the above-mentioned constructs. Affective reactions of the individuals influence their job satisfaction [13], motivation [7], affective commitment [14], well-being [11], and happiness [12].
III. Measuring Affects and Recommendations

We recommend employing the Scale of Positive and Negative Experience (SPANe) [15] questionnaire for assessing the affects of software developers when it is not necessary to understand the affects raised by a particular stimulus. SPANE assesses a broad range of pleasant and unpleasant affects by asking the participants to report them in terms of their frequencies during the last four weeks. It is a 12-item scale, divided into two sub-scales of positive affects and negative affects. The answers to the items are given on a five-point scale ranging from 1 (very rarely or never) to 5 (very often or always). The aggregated scores result in the Affect Balance Score (SPANE-B). SPANE-B is an indicator, with range [-24; +24] of how happy or unhappy people are in terms of how often they feel positive and negative affects. SPANE has been validated to provide good psychometric properties and to converge to other measurement instruments of affects [15].

Instead, for assessing the affects of software developers triggered by a stimulus, e.g., a development task, the Self-Assessment Manikin (SAM) [16] is recommended. SAM is a pictorial, i.e., non-verbal, assessment method. SAM produces three measures for understanding aggregated affects, namely valence, arousal, and dominance associated with a person’s affective reaction to an object (or a stimulus) [16]. For example, for a five-point rating scale, a value of five for valence means “very high attractiveness and pleasure towards the stimulus.”

Many psychological measures, including those reported here, need special attention on the within- and between-subjects analyses of repeated measurements. First, the assessed metrics are not transferrable or stable across persons. For example, an assessed one for an individual’s arousal may be equal to a three for a different individual. However, “it is sensible to assume that there is a reasonable stable metric within persons” (17, p. 10). For having comparable measurements between subjects, the raw scores are transformed into standard scores (also known as z-scores). The measurements become “dimensionless”, thus comparable with those of other participants [17]. Second, the repeated measurements often present two layers of dependency of data: at the participant level and the time level, grouped by the participant. While the analysis of variance family provides rANOVA as a variant for repeated measurements, ANOVA procedures are discouraged [18] in favor of linear mixed-effects (LME) models.

Our last note is on the misuse of the term psychometrics in previous software engineering research. So far psychometrics has been employed to mean psychological measurements [19]. However, psychometrics is the field of study concerned with the implementation and validation of psychological measurements. A measurement instrument in psychology has to possess acceptable validity and reliability properties, which are provided in psychometric studies of the measurement instrument. A modification to an existing measurement instrument (e.g., adding, deleting, or rewording items) often requires a new psychometric study. For similar reasons and for ensuring higher reproducibility, the participant’s instructions should be made available with a paper, because the instructions might influence the participants’ responses.

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