

# Can Time Pressure and Personality Make any Sense together in Software Engineering?

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**Abstract:** Nowadays, software development failure has become a very serious problem. Inaccurate time estimation is one of the major causes of the software development failure. Inaccurate time estimation mostly creates time pressure that causes several negative impacts on software developers' mental and physical health. The past studies had also believed that burnouts and job turnover problems happened due to time pressure. Therefore, the objective of this study is to explore time pressure with human behavior to see if they can make any relation. By this way, one can explore the hidden patterns between time pressure and human behavior in software engineering. In order to carry out the study, personality and time pressure studies are explored in general to see if past studies had ever made any space for software domain. Moreover, based on the limited selected studies, the literature review identifies that several authors had correlated the time pressure with personality. Unfortunately, time pressure and software developer personality are not specifically studied together in software engineering. For that reason, this study leaves some recommendations for researchers to contribute in the very topic to make software development better.

**Keywords:** Time pressure; Software engineering; Personality; Gender

## I. INTRODUCTION

Software has become a very important part of the modern world. Increasing demand of software has created several challenges for software developers to deliver software product based on requirements and time. According to recent studies [1], [2], failure rate of software projects ranges between 50% – 80%. These studies confirm that a failure rate of software is higher than success of software. The term failure is usually called when customer does not get the product on time or demands. There are many reasons that impact successful development of software. Among the very critical reasons, inaccurate time and budget estimation, poor communication, misunderstanding user requirements, lack of top management, lack of user participants, lack of user involvement, incomplete requirements, lack of training, unskilled staff, changing scope and objectives. These all factors are interrelated to each other. It means that ignorance of one factor can damage the other factors that eventually can cause overall failure.

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There may have many causes which makes a software failure and inaccurate time estimation is one of those causes [3]. The main reason of inaccurate time estimation occurrence is usually developers don't get enough time for a task to do. According to the Robert Glass [6] through time estimation managers can identify the time required for a project completion. In software field the time estimation by the managers is reported very bad. Having seen that most of the estimates are more like personal wishes than that of realistic targets. Project managers lack behind improving the bad practices and that put them in a loop of taking shortcuts, neglect the best practices to meet the impossible estimated target. Thus, the evaded schedule causes the technology runaway [4]. Among the many project failure causes the wrong time estimation is considered the top cause in project failures.

Inaccurate time estimation creates time pressure (TP). Short time to complete the task burdens employees to do extra work and it enforces developers to leave jobs. Not only job turnover, TP also badly effects on the physical and mental health. Some studies had even related TP with personal and professional conflicts at home and offices respectively [5]. These things directly impact software project development that eventually causes a negative company image that destroys the market value of the company.

Cooper et al., [6] defined TP as a scarcity, being insufficient, of time to complete a task. Similarly, Baer and Oldham [7] defined TP as degree to which employees realize that they have insufficient time to complete the task related to job or requirement so they should increase the speed of work as much as they can. TP has both positive and negative impact on the performance. Some perceive TP as a positive factor for better performance. For instance, Labianca et al., [8] mentions that people working under TP not only use it as a time management skill but also use it to increase the performance at work. Labianca et al., also reported positive consequences of TP that there are more chances that individuals can achieve other organizational work related goals under TP. On the other hand, some people perceive TP as a mental stressor at work places. As, Ohly & Fritz[9] found TP as a dangerous and unfavorable factor to human health and well-being, and also negatively related to job performance. Gilboa et al.[10] also observed during meta-analysis that TP as a stressor. Moreover, TP is not much appreciated in SE. SE literature mostly relates it to negative impacts. For example, some claims are made as TP enforces software developers simply work faster rather than better or deadlines lead to reduce the quality of software [11]. Project developers sometimes intentionally give TP to the employees to increase the rate of work and productivity. But, not everybody can handle TP in the



same way. Different people deal TP differently. It is, therefore, understanding software developers' personality is important to know for right decisions related to TP. However, personality is a combination of behavior, emotion, motivation, and thought patterns that define an individual. It is a well-known fact that everyone can have different personality type that defines them the way someone gains information and execute it. According to psychologists, not everybody can excel in everything. Project failure or success depends in a secret that task assignment should be according to technical and nontechnical abilities of software developers [12]. In the study of Francis & Robertson [13], Time personality relate to individual behavior, cognition and affects concerned with time. They emphasize on the time personality means there is individual differences to handle the time. Moreover, individual male or female can tackle the time pressure situation differently. Tunio et al., [14] stated that gender differences are assumed to be real, not artificial. Gender are different in the way of emotion, thought, and behavior. For example, women are more emotional than male. Thus, Maria and Gioia [15], had explicitly investigated the effects of time pressure on individual performance based on gender type. They concluded that females handle TP worse compared to males. They also say that TP does not affect the male performance but, on the other side, female suffer a lot. Similarly, another study conducted by Verdonk et al., [16] investigated to know the stress levels among medical interns. They found out that it is very stressful for female students to live up to expectations as they perceived to have more stress.

Additionally, TP with human factor has been considered as an important factor in different research domains but ignored in software engineering [17]. It is, therefore, important to explore the very combination to create space for interested researchers to contribute in the SE domain. Thus, this study aims to investigate the combination of personality, gender and TP to produce some useful guidelines for SE domain.

## II. RELATED WORK

Time is one of the important resources in this modern world. Everybody wants everything quickly that is why many decisions and activities are made under time pressure (TP). It creates mental stress and this stress impact the performance of the individual. Kinicki and Vecchio [18] had defined TP in term of insufficient time to perform certain tasks. Several studies are carried out time pressure and performance. For instance, studies [19] conclude that TP can reduce performance on everything from simple math problems to piloting airplanes. The style of time estimation of the organizations as well as individuals which can be identified; these time style estimations gather to plan the overall time personalities which can govern the responses of various time-related situations. The most influencing productivity and individual well-being is to have relationship between the individuals and organizations having the time personalities. The job satisfaction and mood considered as most important in an organizations, George & Jones [20] have suggested that

these should be dealt with the turnover studies as long as mood affects at work and the job satisfaction can put effect on the work. Different jobs have the different concerns with respect to time, and the outcome of the job totally depend upon degree of match between the person and the job. The best match of the job is the employee is satisfied. Surely, this way one can have good health and low intension to leave the job.

Software development is one of the challenging jobs [12]. Software engineers are group of unique individuals and their Personality influence in software engineering. It is essential to understand the employees with their personality. Capretz [21] concluded in his study that from the combined efforts of a variety of mental processes, outlooks and values will get better software result. Furthermore, it should be noted that everybody cannot perform good in everything. To connect job and skills with personality type can establish the bridge between personality traits and software life cycle phases. According Capretz and Ahmed [12], main five stages of software life cycle can have some specific personality based segregation (*based on Myer Briggs Type Indicator (MBTI)*): extrovert-feeling (E-F) for system analysis, intuitive-thinking (N-T) for designing, introvert-sensing-thinking (I-S-T) for programming, sensing-judging (S-J) for Testing, and sensing-perceiving (S-P) for maintenance. However, authors did not cover TP and gender based segregation. It is said because studies can produce more realistic results if the personality based studies are mapped with gender [22]. On the other hand, according to the Francis-Smythe et al., [23], It is witnessed that those people who have managed to match their time personality with the time characteristics of their jobs are found to have best well-being experiences that that of who have not managed to match. Due to diversity in nature not all jobs are equal with respect to time-related characteristics. For example, agreeableness personality trait (*from Big Five personality*) has strong positive effect on Organization Citizenship Behavior (OCB) under TP.

## III. DISCUSSION

In order to create the space in this domain, fifteen studies were selected based on the keywords: TP, personality, gender and software engineering. Those studies were reviewed and manually analyzed to see the variable selection and methodological setups. In the fifteen selected studies, thirteen studies were included TP as a major factor of discussion. However, it was realized that there are three studies (i.e., S1, S4 and S6 in the Table 1) in which authors had mapped TP with personality. Unfortunately, none of the three studies were from SE domains. Authors from these all three studies strongly correlate the TP with personality. Table 1 presents the selected studies along with the shortlisted variables: TP, personality, gender and software engineering.

Table 1. Some relevant studies

S.No [ref]	Variables			
	Personality	Gender	Software engineering	TP
S1 [24]	✓	x	x	✓
S2 [11]	x	x	✓	✓
S3 [25]	x	x	x	✓
S4 [15]	✓	✓	x	✓
S5 [26]	✓	✓	x	x
S6 [27]	✓	x	x	✓
S7 [28]	x	x	✓	✓
S8 [29]	x	x	x	✓
S9 [30]	x	x	x	✓
S10 [31]	x	x	x	✓
S11 [32]	✓	✓	✓	x
S12 [33]	x	✓	x	✓
S13 [34]	x	x	x	✓
S14 [5]	x	x	x	✓
S15 [14]	✓	x	✓	x

In the same way, only three studies (S2, S7 and S15 from Table 1); were including TP in SE. Not only in this study but Kuutila et al., [17] also found very limited TP studies in the SE domain during their latest systematic literature. Based on the selected studies, no one denies that TP is useful but very dangerous if it is not handled well. On the other hand, time personality researchers claim that time pressure is not a piece of cake for everyone. But, so far no study has been found in SE that studies TP with personality. However, as mentioned, TP in SE and TP with personality are studied separately.

On the other hand, studies conducted by Gilal et al., [2] or Capretz et al., [21] discuss personality very well but their focus is away from TP. Yet, the results are still not improving software development. TP can produce some software process improvement [17]. For instance, Ibanez et al., [33] study results' show that medium level time pressure increase employees strengths. Moreover, gender is also an ignored factor in TP based research studies. Based on the selected studies, only two studies have shown relation to gender variable: S4 and S12. Paola and Gioia [15] take gender with TP and conclude that woman would act differently than men under time pressure. They further conclude that in both genders women are not good in dealing time pressure if they are compared with men. In other words, men can perform better than women in time pressure. Therefore, they say that time pressure has caused negative impacts on the female students whereas time pressure does not effect male student performance neither negative nor positive. Moreover, Gilal et al., [35] studies have explicitly focused male and female personality differences in the software development projects. Their studies have shown that male programmers can perform well if their personality composition consists extrovert trait. On the other hand, female programmers are better in performance if the introvert personality composition is made. Actually, gender is one of the important factors for the better performance. But, it is, therefore, no one can decide same rules for male and female as they are different physiologically and psychologically. For instance, another study conducted by Gilal et al.,[36] concludes that gender impacts the overall performance of software development. The very study claims that the male-lead team performance

would not be the same female-lead team even if the team is same. They further differentiate that both male and female developers feel are easy and productive under the male-lead team. Whereas, female developers seem more comfortable working with female team lead. Based on the above mentioned studies, TP, gender are very important factors to be considered in software development. Unfortunately, these all SE related studies, which focus personality, do not consider TP. Therefore, this study strongly recommends that TP should be studied empirically based on gender and personality.

#### IV. CONCLUSION

This study was started with an objective to see whether a TP and personality can make any relation in SE. Based on the very limited survey, it can be concluded that TP is a subjective matter of knowledge. It is, therefore, very important to study them in detail in SE. It should be noted that authors from other domains, especially project management, had studied them but unfortunately SE domain is yet lacking in it. It was also observed that personality with TP alone cannot bring significant explanations if studied with TP. Because, male and female would demand different traits and types of personality in SE. Thus, it has to be studied together with gender in SE. The future studies can also include the ethnographical differences when consider TP with personality and gender. Because, the brought up mind sets also matter a lot when someone talks about the TP. Moreover, at the end, there are several limitations in this study as this is just a start to show the importance and relation between personality and TP in SE. Hence, it is suggested to carry out empirical studies to learn about the real factors hiding behind the scenes.

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