

BURNOUT IN AGILE SOFTWARE DEVELOPMENT

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ABSTRACT. This article examines the relationship between personality traits measured by the HEXACO model and the prevalence of burnout syndrome as measured by the Maslach Burnout Inventory (MBI). The research was conducted on a sample of nine developers working in the IT sector, who were divided into two groups according to project management methods – the agile Scrum methodology and the traditional waterfall approach. The aim of the study was to determine whether the implementation of the Scrum method can contribute to reducing the risk of burnout and how individual personality traits correlate with selected dimensions of burnout syndrome. The results show that individuals with higher extraversion and conscientiousness show lower levels of emotional exhaustion and depersonalization, while honesty-humility and agreeableness have less influence on burnout syndrome. At the same time, the introduction of the Scrum methodology contributed to better work stress management and work organization in most cases. The results are limited by the small sample size, but they can provide valuable insights for further research as a pilot study.

KEYWORDS: Scrum, burnout syndrome, IT, stress, HEXACO, Maslach Burnout Inventory, agile.

1. INTRODUCTION

In the current times, it is necessary to be able to adapt quickly to changes at work. At the same time, the work demands are elevating, as well as the overall pressure on the individual, which also increases the level of stress that the individual is exposed to. The increased stress level also affects the environment of the individual, thus the stress is transferred to the individual's surroundings. As a result, the stress level has increased among working individuals and the general population [1]. Recent psychological researches show that prolonged stress stimulation without recovery phases can lead to overload of the body. This disturbance in self-regulation has an impact on overall mental well-being, where chronic stress poses risks that are associated with physical, mental and psychosomatic disorders [2, 3]. This research focuses on two main questions:

- (1.) Can the implementation of Scrum reduce the risk of burnout in developers?
- (2.) How do personality traits according to the HEXACO model correlate with the different dimensions of burnout syndrome?

The aforementioned chronic stress can be a cause of burnout syndrome, whose underlying dimensions are exhaustion, cynicism and poor professional performance. Individuals who suffer from burnout tend to be cynical about their work and are unable to perform adequately [4]. These aspects of burnout can further result in the long-term disengagement of an individual from work, reducing the capacity of the work team to do the job, which also results in financial losses to society [3]. The average financial loss due to stress

in the US is approximately \$300 billion per year [5]. The Maslach Burnout Inventory (MBI) is the most used professional method for detecting burnout [6]. It consists of a total of 22 statements that fall into three categories (emotional exhaustion, depersonalization, personal satisfaction). The respondent answers questions from all three categories on a 0–6 scale. As a result, the individual is assigned to a category that rates the degree of burnout in each category as low, moderate, or high [7].

- Emotional exhaustion – a feeling of emotional exhaustion and loss of energy due to work.
- Depersonalization – a cynical and insensitive attitude towards others that manifests itself in alienation and distance.
- Personal success – reduced perception of one's own competence and success at work, leading to negative self-evaluation and feelings of ineffectiveness.

Due to the constant demands for change in the final product, an agile approach to project management has been adopted in recent years, which responds flexibly to client requirements. The most widely used agile method is the Scrum method, which is used by approximately 63 % of agile teams [8]. The advantages of the Scrum method are its focus on team collaboration and its iterative approach to project management [9]. The Scrum method is built on three basic pillars called Scrum Teams, Scrum Events and Scrum Artifacts [10].

Scrum Artifacts provide workflow information for all team members and stakeholders. Scrum Artifacts include:

- Product Backlog – a list of all features, requirements, enhancements and fixes that must be completed to create the final product. This list is managed by the Product Owner.
- Sprint Backlog - the part of the Product Backlog that the development team chooses to implement during one iteration (Sprint). These tasks are selected to meet the Sprint goal.
- Increment - the final product of each Sprint that is functional and ready for deployment, while meeting the Definition of Done criteria.

In addition to the artefacts, Ceremonies are used here, primarily to ensure the rhythm of the work and to regularly assess progress. Each Ceremony has a given purpose, which aids planning, process improvement and overall team synchronization.

- Sprint planning – used to plan activities for the upcoming sprint. The entire team, including the Product Owner, selects tasks from the Product Backlog and creates a plan to complete each item.
- Daily Scrum – a short meeting that takes place once per day. Here, each member of the development team answers questions about what they have completed since the last Daily Scrum, what they are doing now, what they will continue with next, and if they have any problems.
- Backlog Grooming – takes place approximately once a week and is used to improve backlog quality, prioritize tasks, estimate workload (assigning Story Points value) and split large tasks into smaller ones.
- Sprint Review – used to present the increment to the stakeholder team. This step includes discussion on what has been completed, and feedback on the increment is obtained.
- Sprint Retrospective – a meeting at the end of the Sprint where the team evaluates their work and the whole team tries to identify what worked badly during the Sprint, what needs to be improved and what worked well.

A scrum team typically has up to 10 members and consists of:

- The product owner (one person) – takes care of the product backlog, tries to maximize the value of the product, communicates with all stakeholders (Stakeholders), and ensures that their feedback is discussed with the development team and also reflected in the priority of individual tasks [11].
- Scrum master (one person) – ensures that the Scrum method in the team is used correctly, removes obstacles that may hinder the achievement of the goal and coaches the team to help implement the requirements as efficiently as possible at the same time. Scrum master is also in charge of organizing and moderating Scrum events.

- The Development Team – responsible for the implementation of the Sprint Backlog, for which they select the most appropriate tools and techniques at their discretion. The Development Team works together to ensure that the resulting increment meets the Definition of Done. One of the most important responsibilities is also to update the progress during the Sprint.

The basic unit for expressing task complexity here are Story Points, which take into account multiple factors such as task complexity, uncertainty or risk, amount of work, complexity and task scope. The Fibonacci sequence is the most commonly used to determine the value of Story Points [12].

These Story Points are then used to plan the amount of work for one Sprint. A common value for the number of Story Points for one developer is approximately 13 Story Points per Sprint [11, 13].

The HEXACO is a six-factor framework of human personality designed to measure six major dimensions of personality based on respondent self-assessment. The model examines personality in six dimensions that include social and emotional behavior as well as ethical and moral aspects, providing a comprehensive picture of personality in everyday situations. Each dimension contains of several specific statements to which the respondent answers on a scale of 1 to 5 (strongly disagree to strongly agree). HEXACO dimension [14]:

- Honesty-Confidence – in the HEXACO model it has been shown to be key to understanding our behavior towards money, power and relationships. Those who score high on this scale avoid manipulation for personal gain and do not seek wealth or high social status. They are truthful and humble in relationships. On the other hand, those scoring low may be willing to break rules or use sycophancy to achieve material gain.
- Emotionality – Emotionality is characterized by traits such as anxiety, sentimentality, or fearlessness. Those scoring high on the Emotionality dimension of the HEXACO model seek emotional support and are empathic, often due to life stress and fear of danger. On the other hand, those with low scores are less sensitive to pain and stress, do not seek sharing their feelings, and tend to be emotionally distant.
- Extraversion – Extraverts are sociable, but this trait is not the only one that describes this pole of the dimension. In addition, individuals who score high on this scale describe themselves as confident, active, talkative, energetic, cheerful, and optimistic. Extraverts enjoy other people (company), like to be part of groups and various social gatherings, enjoy excitement, and keep a cheerful mind.
- Agreeableness – is characterized by content such as forgiveness, tolerance and equanimity versus irritability, anger and recklessness. On the agreeableness scale in the HEXACO model, individuals with

high scores are those who are willing to forgive and are careful in their assessment of others, which allows them to work well together. On the other hand, those with lower scores tend to confront people who have caused them harm, criticize the shortcomings of others, and hold fast to their opinions.

- **Conscientiousness** – Those scoring high on this scale describe themselves as focused, ambitious, diligent, persistent, systematic, strong-willed, disciplined, reliable, punctual and orderly. These socially desirable characteristics are related to academic and occupational performance, but they also have a negative side when they exceed a tolerable level and manifest themselves as excessive orderliness, pedantry or workaholic behavior. Low scorers describe themselves as careless, indifferent, inconsistent, pursuing their goals with little commitment.
- **Openness to experience** – the scale captures interests and level of interest in new experiences and impressions. Individuals scoring high on this scale report a rich imagination and are more receptive to experiencing positive and negative emotions more than closed individuals. They take new ideas and unconventional values into consideration. They describe themselves as scientific, intellectual, gifted with imagination, willing to experiment, and interested in the arts. They are ready to critically reformulate existing norms and adopt new social, ethical and political values. They often behave unconventionally, try new ways of doing things and prefer change.

The main parts of the HEXACO that can be used in conjunction with the Maslach Burnout Inventory are dimensions called emotionality and conscientiousness. At the same time, individuals with lower emotional stability and low conscientiousness might be expected to have a higher risk of emotional exhaustion. Low agreeableness may be related to higher levels of de-personalization, and low extroversion may indicate less resilience to social stressors, thus a higher risk of burnout [15, 16].

2. MATERIALS AND METHODS

The data collection for the research on the relationship between Burnout Syndrome and personality of the individual was conducted on a group of nine developers (eight male and one female) aged 24 to 35 years, who were selected from an IT company in the USA. Although the sample size is small (9 developers), it was chosen to allow for the possibility of conducting pilot research in the company. The timeframe for the implementation of Scrum was approximately 3 months, which was sufficient for the first observation of changes. In the future, it would be useful to control for confounding variables such as developers' previous experience with different project methodologies. Seven of them had completed the Maslach Burnout Inventory questionnaire before implementing the agile

Scrum methodology in their team, while the remaining two developers (Developer_7 and Developer_8) remained in the original waterfall approach to project management. All nine developers work remotely at the same company.

The HEXACO-60 questionnaire was used to measure personality traits and has high internal consistency with Cronbach's alpha > 0.80 . To measure the level of burnout syndrome, the Maslach Burnout Inventory was used, which has Cronbach's alpha > 0.74 , indicating high internal consistency.

The surveys were conducted using online questionnaires that were sent to the respondents. Personal information about respondents was collected with the consent of the respondents, for the purpose of linking the resulting data; however, as soon as the responses were linked, the personal information was removed, and the data anonymized.

Evaluation of the questionnaire was done using Excel software and subsequent data visualization was done using Python library matplotlib.pyplot. Pearson's correlation coefficient (1) was used to calculate the correlation between variables, which is used for quantitative variables where a linear relationship is expected:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}, \quad (1)$$

where

r is a correlation coefficient between -1 and 1 (-1 negative linear correlation, 0 no linear correlation, 1 positive linear correlation),

n is the number of pairs of values,

$\sum xy$ is the sum of the products of the corresponding values of the variables x and y ,

$\sum x$ and $\sum y$ are the sums of the values of the variables x and y ,

$\sum x^2$ and $\sum y^2$ are the sums of the squares of the individual variables.

A Python script was used to calculate the Pearson correlation coefficient using the pandas library.

3. RESULTS AND DISCUSSION

A total of nine developers participated in the questionnaire surveys, all of whom are from the same company where they work remotely. All of the developers, except Developer_7 and Developer_8 have recently implemented the Scrum method to manage the project they are working on. The remaining developers have stuck with the waterfall method for project management.

3.1. HEXACO

For the survey using the HEXACO questionnaire, one containing 60 questions were selected. The HEXACO

	Honesty- -Humility	Emotionality	Extraversion	Agree- ableness	Conscien- tiousness	Openness to Experience
Developer_1	1.9	4	4	3	2.2	2.2
Developer_2	1.6	4	3.6	3.2	1.7	2.7
Developer_3	2	3.1	2.3	1.9	1.2	1.4
Developer_4	2.4	3	2.5	2.9	3	2.5
Developer_5	1.5	3.8	3.2	2.2	1.9	3.1
Developer_6	2.2	3.8	2.2	2.3	2.5	2.3
Developer_7	1.9	1.9	4	3	1.4	2.7
Developer_8	1.8	3.8	3.4	3.4	1.4	2.4
Developer_9	1.6	3.1	2.3	1.9	1.8	1.7

TABLE 1. HEXACO results.

questionnaire results are summarized in Table 1. The distribution of scores is visualized in Figure 1.

Honesty-Humility. Most developers tend to have lower scores, indicating a tendency to be honest, humble and fair. The highest scores appear for developers 4 and 6, but consistently this is lower than the average, therefore suggesting that the group has low tendencies towards manipulation and self-promotion.

Emotionality. This shows a higher range of scores ranging from 1.9 to 4. Developers 1, 2, and 5 show high emotionality, indicating a higher susceptibility to stress, anxiety, or emotional sensitivity. Developers 7 and 9, on the other hand, will be more resilient to stress and manage their emotions better.

Extraversion. Scores range from 2.2 to 4. Developers 1, 7 and 8 have higher scores, indicating their sociability and preference for a live environment. Developers like 6 and 9, who have lower scores, may be more introverted.

Agreeableness. Most scores are around 2–3, indicating a medium level of tolerance, kindness and cooperation. Developer 3 has the lowest score, indicating that they may be more competitive or less willing to compromise in conflict situations.

Conscientiousness. Developers are in the range of 1.2–2.5. Developer 4 may exhibit more organization, reliability, and a strong work ethic compared to others.

Openness to Experience. The scores here are mostly between 1.4 and 3.1. Developer 5 has the highest score, reflecting creativity and a desire for new experiences, while Developer 3 has the lowest score, indicating a preference for routine and traditional thinking.

3.2. MASLACH BURNOUT INVENTORY

A questionnaire survey for burnout syndrome was conducted twice. The first time was on 16.08.2024, when the Scrum method for managing the development team started to be used for all respondents except Developers 7 and 8.

Developer_1 noted a significant improvement in emotional exhaustion and depersonalisation, which may be related to the introduction of Scrum, which

may have contributed to reduced stress and better organization of work.

For **Developer_2**, there was a slight improvement in emotional exhaustion, but depersonalization remains high. Scrum may have contributed to stabilization here, although not to a significant reduction in stress.

Developer_3 remains stable, with no significant changes. Scrum at this developer is unlikely to have had a significant impact on reducing burnout or depersonalization.

In **Developer_4**, there was a slight improvement in all areas, which could be related to better organization of work thanks to Scrum.

For **Developer_5**, there was a slight increase in emotional exhaustion and depersonalization, suggesting that Scrum did not have as positive an effect here as would be expected.

Despite the increase in depersonalization and emotional exhaustion, **Developer_6** remains in the lower levels, which may indicate that Scrum has helped maintain better control over the workload.

For **Developer_7**, which does not use Scrum, there was no improvement. On the contrary, the level of depersonalization increased and personal achievements decreased. The absence of Scrum may be contributing to remaining at a high level of exhaustion.

Developer_8 also did not experience a significant improvement; on the contrary, there was an increase in emotional exhaustion. Not using Scrum could play a role here in maintaining higher stress levels.

Developer_9 shows stable results with a slight increase in emotional exhaustion, but the improvement in personal accomplishments suggests that Scrum can contribute to better work efficiency.

Developers who started using Scrum (all except Developer_7 and Developer_8) tended to see improvements in emotional exhaustion and depersonalization, or their results held steady. Scrum probably helped to structure the work better and reduce workload. Developer_7 and Developer_8, who did not implement Scrum, reported higher or consistently high levels of emotional exhaustion and depersonalization, suggesting that the absence of Scrum may have contributed

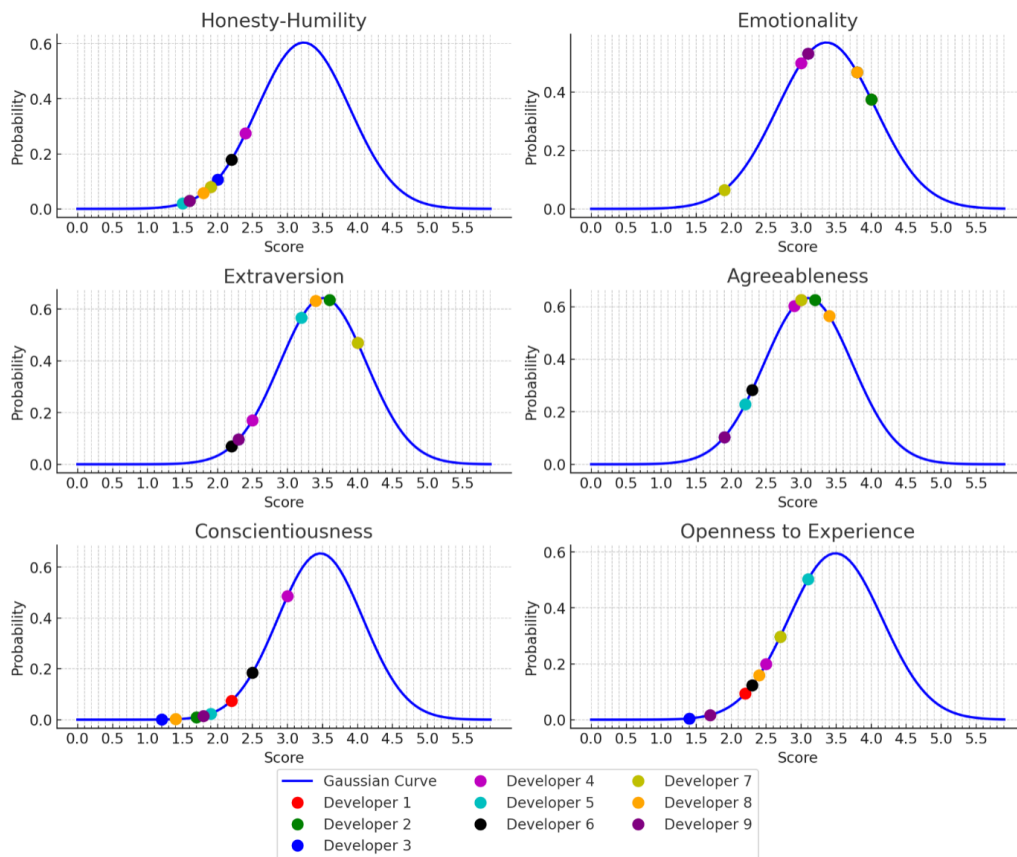


FIGURE 1. HEXACO results in standard distribution.

to sustaining higher levels of stress. The results are consistent with the assumptions of the effect of Scrum on psychological well-being, but the limitations of the small sample size need to be considered. Future research should include a larger number of respondents and a longer time frame to more accurately measure the impact of different methodologies on burnout syndrome.

3.3. CORRELATION OF HEXACO AND MASLACH BURNOUT INVENTORY

Correlational analysis shows that extraversion and conscientiousness have a significant effect on changes in aspects of burnout, while honesty-humility and agreeableness play a lesser role in these relationships. Although the results suggest a significant correlation between extraversion and lower levels of emotional exhaustion, it is important to interpret these correlations with caution given the small sample size. These findings are preliminary and further research is needed to confirm our hypotheses and compare our findings with previous studies on a similar topic.

Change in emotional exhaustion. Strongly positively correlated with change in depersonalization (0.81). This means that an increase in emotional exhaustion is often related to an increase in depersonalization. It is negatively correlated with extraversion (-0.53) and agreeableness (-0.40). Developers with higher extraversion and agreeableness tend to

experience smaller increases in emotional exhaustion. A weaker negative correlation is also seen for conscientiousness (-0.24), suggesting that more conscientious people have a smaller increase in emotional exhaustion.

Depersonalization change (DP_change). Again, it correlates strongly with emotional exhaustion (0.81), confirming the correlation between these two burnout factors. It is negatively correlated with extraversion (-0.40), suggesting that people with higher extraversion tend to have lower depersonalization.

Personal Achievement Change (PA_change). It is strongly positively correlated with conscientiousness (0.67), suggesting that developers who are more conscientious show a significant improvement in their sense of personal accomplishment. The negative correlation with extraversion (-0.47) and agreeableness (-0.54) suggests that more extroverted and agreeable individuals experience less of an increase in their sense of personal accomplishment. A positive but weaker correlation is seen with honesty-humility (0.31), suggesting that more humble individuals may feel a greater improvement in personal accomplishments.

HEXACO dimensions and changes in MBI. Honesty-Humility: Slightly positively correlated with change in personal achievement (0.31), indicating that higher honesty may contribute to a better sense of personal achievement.

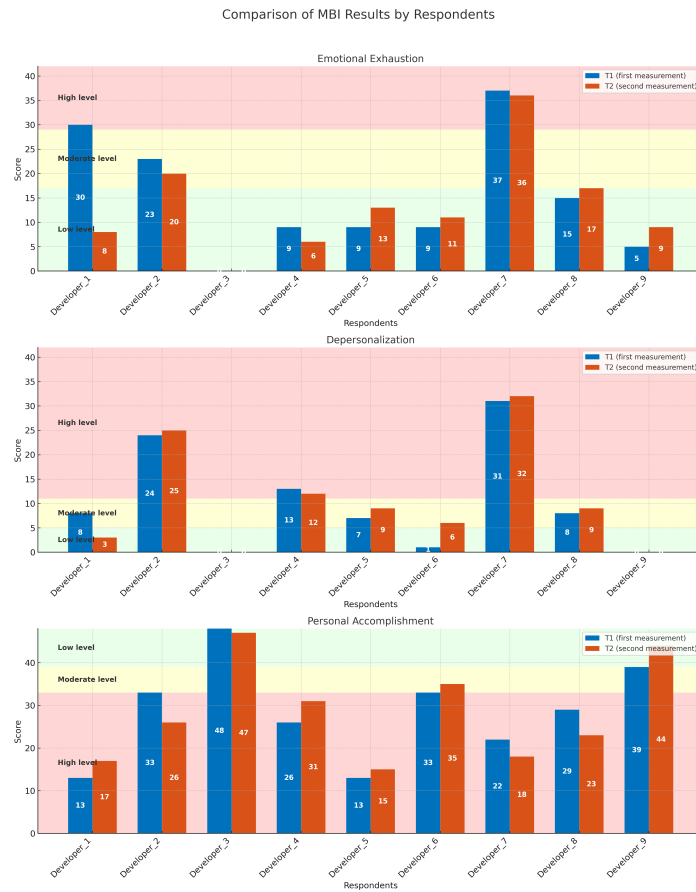


FIGURE 2. Maslach Burnout Inventory results.

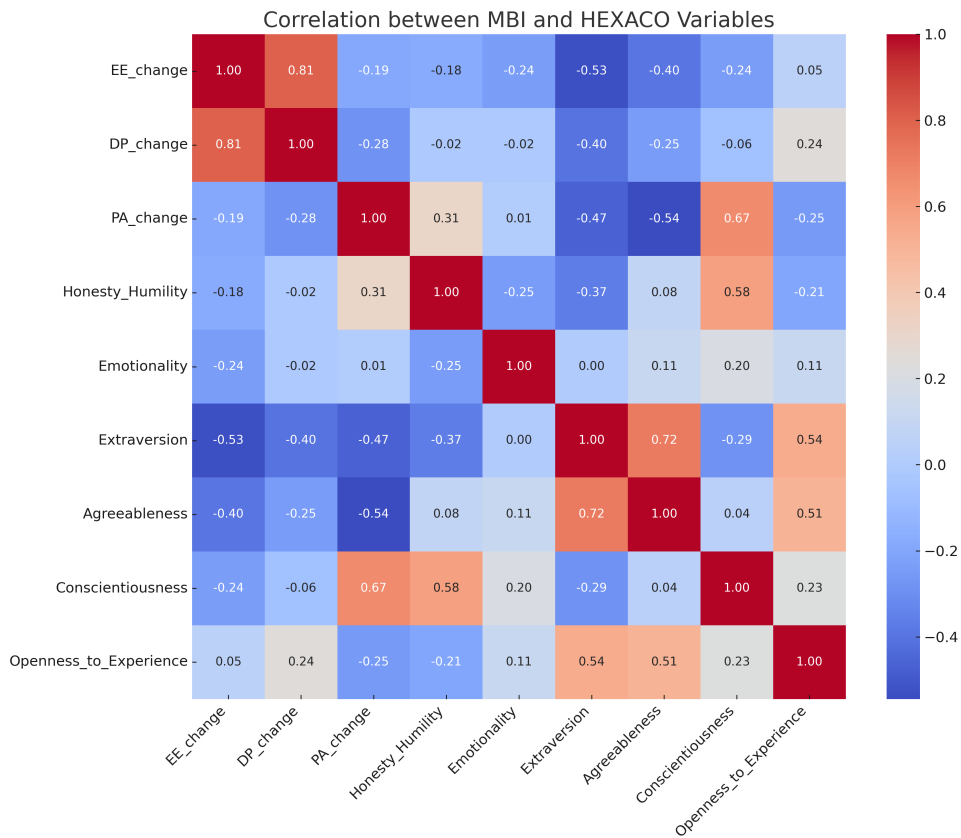


FIGURE 3. Correlation Matrix HeatMap.

Extraversion: strongly negatively correlated with emotional exhaustion (-0.53) and depersonalization (-0.40), suggesting that extraverted individuals tend to experience lower levels of these aspects of burnout.

Conscientiousness: is strongly positively correlated with personal achievement (0.67), suggesting that more conscientious individuals are better able to manage their workload and achieve a sense of accomplishment.

4. CONCLUSIONS

The research shows that personality traits measured by the HEXACO model have an impact on the degree of burnout syndrome, with extraversion and conscientiousness being the most significant predictors. The introduction of the agile Scrum methodology has proven to be an effective tool for reducing emotional exhaustion and depersonalization, suggesting a positive impact on developers' overall mental well-being. However, this effect was not observed for all participants, especially for those who had not implemented Scrum. Thus, the results of the study support the implementation of agile project management methods as a preventive measure against burnout syndrome and highlight the importance of personality characteristics in coping with work stress. This study offers preliminary insights into the impact of Scrum on burnout syndrome and the influence of personality traits on burnout. Given the limited sample, future research should include a larger group of respondents and more detailed analysis over a longer time frame.

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