Toward an Understanding of Preference for Agile Software Development Methods from a Personality Theory Perspective

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Abstract

This paper presents the results of an exploratory research study that investigates factors contributing to preference for the agile software development approaches. The initial exploration revolves around the Five Factor Model of personality and the premise that these personality factors provide a partial explanation of preference for an agile approach. A survey instrument for measuring the preference for agile methods was developed and validated. The results from the quantitative data collected from the survey study indicate that three out of the five personality factors from the Five Factor Model show a correlation with above average preference for agile methods. These factors are extraversion, openness and neuroticism. The first two have a positive relationship with agile preference while neuroticism (emotional instability) has a negative relationship with agile methodology preference. To further investigate the results, an exploratory factor analysis was performed on the data, which identified three factors that may also contribute to a preference for agile methods.

1. Introduction

Agile methods are a rapidly growing means of developing software. As of 2011 in the U.S. about 40% of companies were using agile [1]. In a 2009 Forrester Research report, West and Grant find that about 30% of software developers in the sample of over 1,000 software developers are using some form of agile methods [2]. There is also a growing literature base related to agile methods in software development [3] with ample room for continued study [4, 5]. Not only is agile significant in business and academia, it holds important considerations for management. This study is an initial exploration into factors that correlate with agile methods preference. As more organizations adopt agile methods on increasing numbers of projects, it will be important for management to understand practitioner preferences and take these into consideration to ensure smooth and effective adoption and diffusion strategies.

As organizations seek to find more efficient means to develop software many are turning to agile methods as a way to reduce costs, speed products to market and deal with rapidly changing customer and business requirements [3, 6]. Dyba and Dingsoyr [3] note the limited theoretical base utilized in agile research indicating a need for additional empirical based studies that generate and confirm theories related to agile methods. Balijepally et al. [5] encourage studies of agile methods with regard to personality traits, particularly studies utilizing the Five Factor Model of personality.

In this article we investigate the role that personality plays in regard to preference for agile methods. We focus on the Five Factor Model (FFM) [7, 8] personality model to determine if there is a correlation between the five personality traits and preference for agile methods among software developers. The key research questions are: What are the factors that contribute to preference for (or against) adoption and use of agile methods? How do we measure a developer's preference for agile software development methods? From a theoretical standpoint we use FFM personality theory and the literature on agile methods as a starting point to explore potential factors associated with agile preference. From a practical standpoint it will be valuable to understand if agile preference is significantly influenced by personality. Management can use this information to assist with organizational adoption of agile methods and integration of new and existing software development staff members who may not have experience with or preference for the agile approach to software development. This paper represents a pilot study into the factors that influence preference for agile software development methods.

The paper is organized as follows. First a review of the relevant literature related to agile methods and personality studies in relation to software development will be presented. It will then describe the theoretical research model and its operationalization. Following this will be a discussion of the data collection process and subsequent data analysis. Finally the paper will finish with some concluding remarks concerning the results of the study and future research directions.

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2. Literature Review

2.1. Agile and Traditional Approaches

Over the last decade two decidedly different approaches to software development have emerged. The traditional approach is characterized by terms like waterfall, sequential, or even spiral development. These approaches are often called "plan-based" or "plan-driven" in the literature [6] with an emphasis on big design upfront (BDUF) [9]. They emphasize planning, sequential execution, documentation, specific roles and predictability [5, 6]. Philosophically, traditional approaches have sought to impose order and control on the software development effort [10].

In contrast to the traditional approaches are agile methodologies. Rather than control and prediction, agile methods seek to react and adapt [11]. Agile methods have their roots in the 1990s culminating in a manifesto developed in 2001 which stated the essential concepts at the heart of agile methods. The manifesto lists a set of twelve guiding principles developed by the Agile Alliance [12]. Among the emphasis in the twelve principles are the beliefs that working software is a priority over documentation, early and frequent delivery of working software is a priority, daily collaboration between users and developers, trust in the front line workers (business and technical), face-to-face communication is better than written documents, progress is measured by working software, consistent pacing rather than periodic heroic efforts, emergent rather than prescriptive design/architecture, reflective team adjustments [12]. The enduring value and importance of the principles found in the Agile Manifesto is confirmed by a recent study performed by Williams [13].

Clearly the two approaches have very different orientations, agile takes an iterative approach compared to the big bang release approach of traditional methods. Part of the motivation behind this research is to investigate the possibility that an individual's personality may influence their preference for one or the other software development methodologies.

2.2. Personality Theory and Software Development

Studies have suggested that there is a significant difference in regard to personality traits in the United States between the population at large and engineers including software engineers [14]. A variation on this theme was done to show a relationship between the Meyers-Briggs Type Indicators (MBTI) personality traits and specific roles used in traditional plan-driven software engineering [15]. Capretz [16] also compared software engineer MBTI personality traits with all other engineer personality traits and found them to be very similar and distinct from the distributions in the general population. Similar work has been done among the Cuban software engineer population [17].

A concrete implementation of agile principles is eXtreme Programming (XP). One of the practices of XP is that programmers work in pairs to mutually understand and solve problems while development the software. This practice is called pair-programming. A recent study used the MBTI assessment to investigate the relationship between personality types of programmers participating in pair programming and cohesiveness in the team environment [18].

In addition to MBTI based studies, some personality/software engineering studies have been performed using the Five Factor Model [19]. The Five Factor Model uses the following traits openness (O), Conscientiousness (C), Extraversion (E), Agreeableness (A), and Neuroticism (N). In their paper, the authors illustrate using the conscientiousness characteristic to evaluate preference for working alone or in groups as an illustration of the types of studies that can and should be done using this personality based approach. The authors call for more empirical and personality based studies to be published in the software engineering domain.

There have been numerous studies published in relation to team and peer-programming situations utilizing personality traits. Agile methods emphasize people, relationships and teamwork, so it makes sense that a variety of studies have been published in this area. Some studies use the Five Factor Model previously mentioned and a very closely related model called the Big Five model. For example, an empirical study was performed using the Five Factor Model to identify relationships between the five personality traits and autonomy, interdependency, cohesion and conflict within the team [20].

Balijepally et al. [5], argue for the use of the Five Factor Model (FFM) as a psychometric tool for understanding agile team dynamics and call for more studies using FFM in Information Systems research. One operationalization of the Five Factor Model is through the International Personality Item Pool Representation, otherwise known as the IPIP instrument, which is freely available online [5].

Another implementation of the Five Factor Model is the Big Five Inventory survey instrument [8].

Given this background of research in personality theory and information systems, along with the call for additional research, the current study is designed to explore the possible relationship between personality traits and preference for agile methods.

3. Research Model

The proposed theoretical model, as shown in Figure 1, is an attempt to relate personality type theory to preference for agile methods. Along these lines, it is posited that four of the five factors in the FFM will have a positive correlation with the agile preference dependent construct. The neuroticism trait, on the other hand, is posited to have a negative correlation with agile preference due to the anti-social implications of this trait. We base this framework on the socio-technical emphasis of the agile method compared to the technical focused plan-based approach as described in Section 2. We further elaborate on the theoretical rationale below.

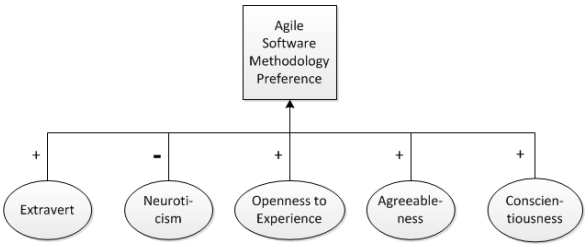

Figure 1. Research Model

Extraversion can be contrasted with introversion. It is a measure of an individual's energy and willingness to engage with people and the world around them. The Five Factor Model is a hierarchical model and extraversion is composed of elements like gregariousness, assertiveness, activity, excitement-seeking, positive emotions and warmth [7]. Individuals scoring high on extraversion have high sociability.

Table 1 - Agile preference principles

Principle	Agile Principle Description
P1	Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
P2	Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
P3	Business people and developers must work together daily throughout the project.
P4	The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
P5	Working software is the primary measure of progress.
P6	Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
P7	The best architectures, requirements, and designs emerge from self-organizing teams.
P8	At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.
~~P9~~	~~Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.~~ Deemed redundant to P1.
~~P10~~	~~Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.~~ Deemed universally desirable.
~~P11~~	~~Continuous attention to technical excellence and good design enhances agility.~~ Deemed universally desirable.
~~P12~~	~~Simplicity the art of maximizing the amount of work not done is essential.~~ Deemed universally desirable.

The agile principles labeled P3, P4, P7 and P8 all have a social orientation. These agile principles emphasize face-to-face communication between both technical and non-technical project members. In addition they emphasize coordinated group activities like self-organizing and improvement through group reflection all of which put a premium on social interaction.

Based on the preceding information, it is hypothesized that those with a higher preference for agile will show higher extraversion than those with lower preference for agile which leads to the first hypothesis:

- **H1 – Extraversion is higher among those with a preference for agile**

Neuroticism is a measure of a person's tendency toward unpleasant emotions like anger, anxiety, depression or vulnerability. A higher score on this measure indicates greater emotional instability. Sub-scales like anxiety, hostility, self-consciousness and vulnerability [7] all contribute to an anti-social bias

for individuals scoring highly on the neuroticism measure.

Based on the previously argued social nature of agile methods it and the decidedly anti-social characterization presented by neuroticism it is hypothesized that this measure has a negative relationship with agile preference. The higher an individual's neuroticism score the less likely they are to prefer agile methods. This leads to hypothesis number two:

- **H2 – Neuroticism is lower among those with an agile preference**

Openness to experience can be described as the propensity of an individual to appreciate a variety of experiences with a preference for novelty and intellectual curiosity. Openness to experience is a composite of characteristics like curiosity, imagination, and a wide variety of interests [7].

Openness aligns well with Agile's adaptive and action oriented posture. Agile is an action oriented approach involving an emphasis on delivery of working software rather than static documents and interactive engagement with a variety of people throughout the project. Consequently, it is anticipated that high scores on this variable will correlate with preference for agile methods leading to hypothesis number three:

- **H3 – Openness to experience will be higher among those with an agile preference**

Agreeableness is consistent with cooperation with others and compassion for others. It is also consistent with a high degree of trust and helpfulness. Sub-scales on this dimension are trust, straightforwardness, altruism, compliance, modesty, and tender-mindedness [7]. Although not as decisive as the previous characteristics, these still present themselves as attributes that appear congruent with a team oriented methodology with a heavy emphasis on face-to-face communication. Therefore the theory models this characteristic as having a positive correlation with agile preference.

- **H4 – Agreeableness will be higher among those with an agile preference**

Conscientiousness is a trait related to self-discipline with the aim for achievement as measured by external expectations. The contrasting trait is lack of direction. Conscientiousness breaks down into traits like competence, orderliness, dutifulness and deliberativeness [7]. Conscientiousness does not present a definitive relationship to agile methods, but characteristics such as competence and thoroughness along with self-discipline encourage the inclusion of this attribute as a having a positive correlation with preference for agile methods.

- **H5 – Conscientiousness will be higher among those with an agile preference**

In summary, the model is composed of three positive factors that are expected to positively correlate with agile preference and one factor expected to have a negative correlation with agile preference. This is primarily based on the social nature of agile compared with the technical and artifact focus of plan-based traditional approaches.

4. Research Methodology

A survey research methodology was utilized to test the research hypotheses. The survey was implemented in an online web-based format and was made up of both personality trait items and agile preference items. 230 responses were received of which 195 were usable. Participants ranged from large publically traded companies, state government employees and university students. Participation was solicited using email as well as web forum postings.

4.1 Survey Instrument

In order to operationalize the theoretical constructs two instruments were utilized. First an established set of scales called the Big Five Inventory [8] were used to measure personality traits along the dimensions of the Five Factor Model. For the measure of agile preference no instrument was found in the literature so one was developed. The Big Five Inventory (BFI) is designed to be a relatively short assessment of personality traits utilizing 44 items [7]. There are longer implementations of the Five Factor Model available but the BFI was chosen since it has a high reliability with fewer questions allowing for a higher completion rate by participants. The survey instrument and scoring instructions are freely available online.

Since no agile preference instrument was discovered through the literature review, a new instrument was developed. The instrument is based on the 12 principles of the Agile Manifesto [12]. This approach was selected because the agile principles provided a convenient framework for the construction of the survey instrument and due to their continuing relevance in the industry [13]. Future research will rely on more robust academic definitions and constructs [21, 22]. The concept is to create a set of scales with a multi-item approach to measure the preference for each principle. Prior to embarking on creating the items analysis was done to ensure the relevancy and appropriateness of each principle as a measure of agile preference. Two principals were deemed essentially redundant; the first and third statement of the agile manifesto

principles both communicated the desire to deliver software frequently so the study combined those two principles when constructing the preference instrument. There were also three other principle statements that were determined to be universally desirable by all methodologies and software developers and therefore did not provide discrimination or differentiation between agile methods and any other methods. These principles consisted of the desire to involve motivated people on a project; to deliver technical excellence in the solution; and to minimize the work done (or maximize the work not done). Since these were considered not to be unique to agile software development methods we chose to eliminate them from the survey since we assumed all developers would find these attractive regardless of their preferred software methodology.

This left a total of eight principles by which preference will be measured. The approach taken is that if there is high affinity with these principles then there is significant preference for agile methods. We list the working definitions for the principles in Table 1 which are derived from the Agile Manifesto [12].

With the discriminating principles we then developed phrasing for each item. Originally ten potential items were developed for each of the eight scales associated with the eight principles. In terms of content validity, we presented the items to a panel of experts composed of two software engineering practitioners and three academic specialists from the field of Information Systems. The panel was asked to categorize item statements as any one of the eight agile principles or as a non-agile principle. An example of the expert panel questionnaire form is shown in Figure 2.

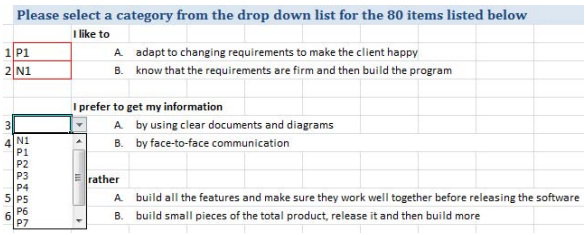

Figure 2 - Expert Panel Questionnaire

The results of the panel's categorizations were evaluated and those items with the highest inter-rater reliability were selected as candidates for the survey instrument. Additional analysis was performed to eliminate or reword items that indicated bias. After these two steps the resulting survey instrument contained five items per principle (see appendix).

A summative scales approach was employed for the survey. Summated scales assist in overcoming measurement errors through the use of multiple indicators and provide the ability to represent multiple aspects of a concept in a single measure [23]. Each question had dichotomous completion options, one completion being agile in nature, the other non-agile. This design was chosen since it is congruent with the MBTI form of questions and the authors felt it would be better to present a consistent format of questions. During data collection the MBTI was dropped from the study and the preference question form was not reworked. Future research will switch to the more familiar Likert scales. If the agile completion was selected that item was scored as a one. If the non-agile completion was selected then that item was scored as a zero. The score for each principle was the sum of the five items associated with that principle resulting in a maximum of 5 for a single principle and a minimum of zero. The total agile preference was the sum of scores for all eight principles. Given this scoring approach the maximum total agile preference score was 40 and the minimum agile preference score was zero.

Due to the use of a dichotomous completion approach traditional convergence measures like confirmatory factor analysis were not appropriate. Instead to provide an assessment of item convergence on principles we considered that if a participant consistently answered all five questions that would be a good indication of convergence of the indicators on the appropriate principle. To accomplish this we considered the number of participants scoring zero, one, four or five (two and three were considered neutral or ambiguous) for a particular principle indicating that they consistently chose completion options resulting in decisive preference or lack of preference for that principle. If a subject scored a two or three on a particular principle then the line of questions did not result in a consistent score and thus did not indicate convergence. It is recognized that this is an unconventional approach, but was chosen because of the simplicity involved in the dichotomous scale. In the future studies, we plan to evaluate the possibility of using the Likert scaling, which will allow for a more traditional assessment of convergent and discriminant validity. In lieu of the more traditional evaluation, we utilized the previously mentioned approach and found that each principle had better than 50% zero/one or four/five scores demonstrating consistency in the constructs.

Table 2 - Score Consistency Per Participant

N=195	P1	P2	P3	P4	P5	P6	P7	P8
Count of decisive	123	108	116	142	99	116	109	137

responses								
% of decisive responses	63	55	59	73	51	59	56	70

4.2 Data Collection

The combined survey instruments were implemented in an online web-based format. In this way, the survey was made available to participants regardless of location. The first web page of the survey was the agile preference component. When the participant clicked the next button their preference responses were saved and then they could complete the Big Five Inventory items. There was some mortality where participants completed the preference but did not complete the BFI questions. These incomplete responses were not included in the final data analysis.

Electronic mail, forum postings and in-class opportunities were utilized to recruit participants. These included two medium to large sized technology focused companies. Contacts at these two companies were provided with an invitation to forward to their colleagues within the respective companies. In addition a state government software development division allowed a department wide email invitation to be sent to all 120 employees. A final source for participants was at a university where one of the authors is an instructor. The justification for utilizing students in the research is that the focus is on personality traits as a predictor of agile preference. Therefore significant programming experience is not crucial since we are actually investigating personality rather than other factors. Multiple sections of an introductory information systems course were invited to participate as well as students from a section of introduction to programming. All students were shown the same 20 minute video overview of agile methods and plan-based approaches to software development as background information. In addition to the corporate, government and student recruitment sources, requests for participation were posted in two online forums – Yahoo's XP group and LinkedIn's Scrum Practitioner group.

These solicitations resulted in 230 respondents of which 195 were complete and used in the data analysis. 142 of the participants were students while the remaining 53 were from industry and government. There were no missing values in the 195 responses.

5. Data Analysis

5.1. Sample Characteristics

Total agile preference scores range from a low of 4 to a high of 40, the mean of the total agile preference scores is 24.554 and the standard deviation is 7.032.

Four of the five factor personality values deviated less than 10% from the national averages for the 24 to 30 year old U.S. population. The exception is on the neuroticism dimension in which the sample was 18% lower than the national average indicating above average emotional stability in the sample. The following data analyses used SAS Enterprise Guide 4.2 as the statistical tool.

5.2. Hypotheses Testing

One aspect of the data analysis focuses on the use of t-tests to detect differences between the means of those participants with above average preference for agile methods compared to those with below average preference. The variables were tested for normality by the Kolmogorov-Smirnov test and found to not differ significantly from the normal distribution ($p < 0.01$ for all variables) [10]. The 195 responses were classified as either high preference if their total agile preference score was above the mean (24.554) and low preference if their total agile score was less than the mean. There are 90 responses in the high preference classification and 105 in the low preference classification. Five separate t- tests were performed one each between total preference and the five personality dimensions. The results and impact on the hypotheses are shown in Table 2.

Table 3 – t-Test results

Personality Dimension	p-Value	Hypothesis Confirmed?
H1 - Extraversion	0.032*	Yes
H2 - Agreeableness	0.173	No
H3 - Conscientiousness	0.308	No
H4 - Neuroticism	0.092**	Yes
H5 - Openness	0.049*	Yes
* alpha 0.05 ** alpha 0.10		

The data confirms three of the five hypotheses. Not surprisingly extraversion has a correlation with agile preference. As mentioned previously this is

expected due to the highly social nature of agile methods. In addition openness is also supported as having a positive correlation with agile preference. Agile attracts those with curiosity and an action orientation. Part of openness is having unconventional values. It will be interesting to see if openness continues to have a positive correlation as agile methods become more widespread and conventional over time or if this correlation is due to the novelty of agile in today's software development culture. Neuroticism is also confirmed as having a negative relationship with agile preference. This is expected and attributed to the anti-social characteristics of emotional instability.

The two factors that where the null hypothesis could not be ruled out are agreeableness and conscientiousness. The lack of correlation for conscientiousness is understandable. The facets for this factor lean toward orderliness, dutifulness and striving for achievement [7]. All of these line up well with traditional methodologies and are somewhat contrary to the exploratory and adaptive nature of agile methods. Embracing change late in a project can be disruptive which could be discouraging to someone seeking order. Agreeableness may not be well aligned with the need for self-organization and improvement through group reflection which may require introspection and some degree of disagreement before resolution can be achieved. This disharmony, although temporary, may be uncomfortable for those who score highly on this measure.

5.3. Exploratory Factor Analysis

An Exploratory Factor Analysis (EFA) was performed on the sample data. The following analysis includes the entire 195 responses. Hair et al. [24] make a number of recommendations regarding Exploratory Factor Analysis. These include having 5 times the number of observations as the number of variables. In this case we have eight preference variables so the minimum number of observations is 40. Our data includes 195 observations and therefore satisfies the minimum observation requirements. Kaiser's Measure of Sampling Adequacy was 0.704 overall and each of the variables exceeded the recommended 0.50 threshold. Latent Root Analysis of the resulting factors indicated that three factors exceeded the 1.0 Eigenvalue minimum threshold and therefore were retained. This is illustrated in the scree plot shown in Figure 3.

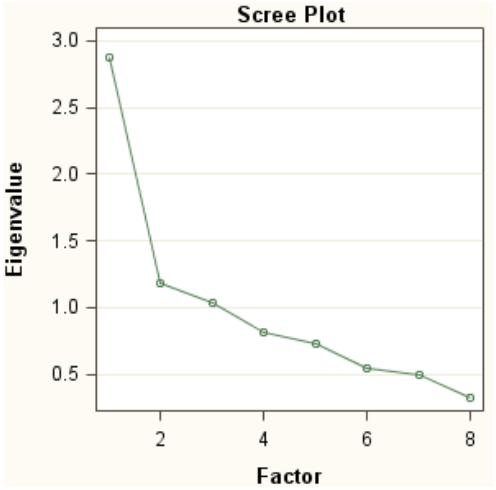

Figure 3 - EFA Scree Plot

Variables	Factor 1	Factor 2	Factor 3	Communality
P3 - Work together daily	0.778			0.679
P4 - Face-to-face conversation	0.673			0.572
P7 - Self-organizing teams	0.640			0.656
P8 - Self-reflection based tuning	0.625			0.517
P5 - Working software measures progress		0.649		0.692
P1 - Early and continuous delivery of valuable software		0.607		0.692
P6 - Sustainable development			0.851	0.872
Interpretation	**Social Orientation**	**Delivery or Action Orientation**	**Sustainability**	

Figure 4 - Exploratory factor analysis

The results indicated three significant factors emerging from the data. The last row in figure 4 is the interpretation of these factors based on synthesizing the associated variables for each factor. Social orientation captures the nature of the four agile principles associated with factor one. Each of the principles involves some type of interpersonal interaction. Factor two involves delivery of software either as the measure of progress or as a risk reduction and feedback mechanism. It also indicates an orientation toward activity rather than static artifacts. The third factor consisted of only a single agile principle related to sustainable effort demonstrating the desirability of being able to maintain a steady pace over the long haul and avoiding continuously extreme workloads.

Consideration was given to performing the EFA on only the professional responses and excluding the student responses. The line of reasoning was that

professionals may exhibit different factors due to their practical field experience compared to the academic experience of the students. But a comparison was performed on the two sets of data (professional and student) and the same latent factors were identified with both data sets. Consequently the EFA utilized the complete set of data without distinction.

6. Discussion

The results demonstrate that some personality characteristics play a part in preference for agile methods. The data supports a positive relationship between extraversion and agile preference as well as openness and agile preference. The data also indicate a negative relationship between neuroticism and agile preference. But the results were not significant enough to account for a substantial amount of variability in total agile preference based solely on the Five Factor Model of personality as indicated by the unsuccessful multiple regression model.

An interesting implication arises out of the finding that personality does not completely explain an individual's preference for agile methods. If personality completely explained preference then the ability to modify preference would require modifying personality. Since personality isn't the exclusive factor this leaves opportunity for identifying additional factors of influence in preference. Once those additional factors are identified then programs can be designed to manipulate preference leveraging the additional factors. A second practical implication is that there is some correlation between extraversion, openness and neuroticism which means management and future research can take these personality characteristics into consideration when designing future programs involving agile preference.

7. Conclusion

This study explored the role of personality theory in preference for agile methods. The results suggest that there is significant correlation between three of the five traits in the Five Factor Model of personality. The study also identifies three additional factors through an exploratory factor analysis that may correlate with agile preference. Social orientation, action orientation and a desire for sustainably paced software development emerged from the EFA.

Future research will be directed toward creating and validating a Likert scale based agile preference instrument. An instrument based on Likert scales and conventionally validated will provide confidence for future exploration of agile preference and will be a useful contribution to the body of knowledge. Another direction will be to develop a comprehensive literature review and execute a qualitative study to identify relevant theories and additional preference factors with the goal of creating a theoretical model of antecedents to agile method preference and an associated quantitative study to confirm the proposed model. As agile methods continue their widespread adoption understanding individual software developer preferences and there drivers will be a valuable management tool.

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Appendix

Table 4 - Preference Survey Instrument

Question	Completion Option
To satisfy the client, I like to	o adapt to changing requirements o know that the requirements are firm and then build the program
I prefer to get my information	o by using documents and diagrams o by face-to-face communication
I'd rather	o build all the features and make sure they work well together before releasing the software o build small pieces of the total product, release it and then build more
I prefer	o working with the software users on a daily basis o working with written specifications and documents
I believe customer satisfaction is best achieved by	o using Gantt charts to demonstrate how we are meeting their requirements o providing software every month to provide them new working features
I believe the best way to manage requirements is to	o put a stake in the ground by freezing requirements changes and then complete the software o let the system requester make requirements changes at any point in the development process
I feel team efficiency and effectiveness is essential to	o so the team should regularly evaluate their practices and brainstorm ways to improve o so a good project manager is needed to consistently improve the team's performance
I think the best form of communication for software development is	o through written records of requirements and validation tests o accomplished by people talking face-to-face
I feel there are many ways to measure progress	o but delivering working software is the best way o but estimated task completion percentage is the best way
It is important to	o follow the recommendations from the project leader for group effectiveness o reflect together as a group on how to become more effective
I believe architecture, requirements and design should be	o developed by the team based on their internal cooperation and self-organization o assigned by the project manager to the appropriate skilled individuals on a team
Whenever possible, discussions about requirements, design and implementation should take place	o through face-to-face conversations o through documented specifications
I'd rather	o work in waves with periods of intensity and periods of slower pace o work at a constant pace over the long haul

I believe customers are pleased when	o they get the final product with all the features included even if it takes a while to complete o they receive early and frequent releases that include new features
I think progress is extremely difficult to measure so	o the best information comes from measuring how much of the software is delivered and working o the best information comes from calculating the percentage complete based on individual tasks
I feel the best way to improve team performance is to	o allow the team to reflect and then self-adjust their practices o periodically engage the project leader to evaluate practices and make improvement proposals
I enjoy	o working in longer phases and delivering a finished product o smaller, frequent delivery of software even though not all features are implemented
I believe changes to the requirements mean	o that the customer will have competitive advantage in the market and should be welcomed o that there will be significant rework and should be avoided
Given the pace of business today I believe	o it is essential that software development scheduling keep a sustainable pace to provide benefit into the future o it is inevitable that there will be long working hours to complete projects and teams mays suffer burnout
I think to become more effective	o periodically the team should reflect on their practices and adjust their behavior in agreed upon areas o periodically project leadership and management experts should review team practices and make appropriate suggestions for improvement
I like it when	o there are clearly defined roles o the team organizes itself and roles are fluid
I'm persuaded that our team's top priority should be to	o incrementally and regularly deliver software to satisfy our customers o stay on schedule and complete critical path tasks to meet the project goals
I believe teams work better when	o a project leader directs the work based on roles and the needs of the project o the team self-organizes by making group decisions on how work should proceed
My experience tells me face-to-face communication	o is often not practical so alternatives are equally preferred for pragmatic reasons o should be the preferred method of communication on a software development project
I am convinced that team functioning is important for successful project execution	o so relationships and roles should evolve internally within each team o therefore structure is significant and a competent leader should assign roles o
I believe the best time to get new requirements is	o at the beginning of the project when they can be incorporated into the design easily o whenever the customer sees value in the new requirement, we will adapt appropriately
I know burnout is a serious problem in software development so	o care must be given to not overwork developers to meet deadlines o focus on those developers with stamina and heroic capabilities and build your team around them
History tells me in order to get the architecture, requirements and design right	o teams should be allowed to self-organize o assignment of staff to appropriate roles is essential
I like	o using the delivered software as a measure of progress o completing my assigned tasks and using that to measure progress toward the overall goal
I like it when business users	o engage with the whole development team o work with the systems analysts to define requirements
Given the choice	o I'd rather meet periodically, get the user's needs in writing, and then create the software to meet their needs o I like daily interaction with the people who will be using the software to make sure I know what they want
I like it when	o changes occur, it means the customer is getting what they need o user requirements are signed off and finalized before any software is written
I believe software developers are a valuable resource so their	o skills should be maximized by working overtime to meet project goals o daily hours should be controlled such that they can work continuously, year after year
I think software development project progress is best measured by	o tracking task completion against a formal project plan o delivering working software incrementally to the users
When working on software development projects I like to	o push to meet a big delivery goal, take a breather and then do it all over again o keep a consistent level of productivity that I can maintain year around, year after year
My experience tells me software is best developed when	o developers work directly with business people daily o only the trained analysts deal with business people
I believe teams should	o brainstorm together on ways to improve performance on a regular basis o submit anonymous suggestions to management on how to be more productive
I believe face to face	o communication is difficult and therefore should be minimized o is the preferred method of communication because it is effective
I think it is best if	o requirements are gathered from business users and are only re-engaged when the functionality is ready to be tested o business folks and developers interact almost daily to ensure requirements are met
The best measure of progress is	o The best measure of progress is o the percentage of tasks complete on the project plan